New York, Saturday, September 27, 1924

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review
Published by McGraw-Hill Company, Inc.
Henry W. Blake and Harry L. Brown, Editors

Volume 64
Number 13

ANNUAL CONVENTION NUMBER—"MODERNIZATION"

MODERNIZE

MENTALLY AND MECHANICALLY

By Britton I. Budd

President American Electric Railway Association
President Chicago Rapid Transit Company

THE "Journal" is to be congratulated on devoting its Annual Convention Number this year to the subject of "Modernization" and on having so many representative men in the industry contribute their views on this important subject.

To me the term "modernization" is the most comprehensive in the lexicon of the electric railway industry. It means the modernizing of mental as well as physical equipment. It means a new understanding of the spirit of service, of the relationship between utility companies and the public which they serve.

Without this new understanding of the public, this spirit of willingness to provide the most and best possible service at the lowest cost commensurable with doing justice alike to those receiving and those supplying that service, we have not "modernized" as I understand the term.

Nowhere has progress been more marked in the last decade than in the field of transportation. The modern concept of transportation service is radically different from that of a few years ago. The users of transportation service today do not think in the terms of yesterday. Their ideas have been modernized by the automobile, the motor coach and other developments in the transportation field, as the radio has revolutionized their ideas on the means of communication. Have the men charged with the responsibility of supplying service grasped the meaning of the new order of things as clearly as have their customers?

We hear a great deal today about the "education of the public." If by that is meant that the public can be educated to accept the practices common in industry a few years ago, such efforts at "education" are hopeless. The wheels of progress are not going to run backward. The education must begin at the other end. The transportation executive must be educated to get the point of view of the public.

A New Day Has Dawned in Transportation

IT IS futile to speak of the "good old days" when the best transportation service was infinitely worse than the worst is today and the public was better satisfied. That is water gone over the dam. A new day has dawned and a new character of service is demanded. We are here to supply that service, and if we cannot do it to the satisfaction of our customers we will be brushed aside, as we ought to be, and other agencies will take our places. The procession will move forward and we must keep step or be trampled upon.

The underlying motive by which the public utility executive must be governed is service. To give service we must have the necessary tools at our command. That means modernization of equipment, better cars and roadbed, higher speed and greater comfort to our customers. But when all those things are provided we shall still be wanting in the most important phase of our work if we do

not know our customers and treat them with understanding.

The large corporation has many advantages over the smaller one in the way of reducing the cost of production. It can operate more economically because of the volume of its output, and this economy is shared by its customers. But it has its disadvantages also. The larger it grows the farther are its executives removed from contact with the people it is in business to serve. The greater the size of the company, the greater the danger of losing sight of the human element so essential to public good will. The smaller company can more easily "personalize" itself to its customers than the larger one.

"Personalize" the Corporation

THE public attitude toward the utility company has changed greatly for the better in recent years. It will be found that this change has been brought about in proportion to the degree that the company has accepted the new concepts of service, that it has sought to cultivate good will by humanizing itself to its customers. Public relations are improved by actions more than by words. An improvement in service is more effective than a striking newspaper advertisement. The personal visit of a representative of the company to a complaining customer will do much more in the way of creating good will than the best letter that ever was written. Every complaint about service should be given immediate attention. The matter complained of may in itself be insignificant, the accumulation of small grievances breeds ill will and finally results in a big explosion.

In "personalizing" itself to its customers the public service company should have no inflexible rules. Every company must have well-defined rules for the conduct of its business, but the accommodation of the customer is of more importance than the strict observance of a company rule. If a customer makes a request for some small accommodation and is told that to comply would be "against the rules of the company" it does not create a favorable impression in the mind of that customer of the company or respect for its rules. A company cannot afford to be the slave of a rule. A slight infraction might change an unfriendly customer to a friendly one.

Service Is the First Consideration

TO attain this new understanding of the spirit of service to which I allude, educational work must be done among the employees of a company. Every one in the employ of a utility company, from the highest to the lowest, must be made to understand that service is the first consideration. When they understand that the chief rule for their guidance is the pleasing of customers, they will not give offense by saying that something is "against the rules of the company."

How can employees be brought into the proper frame of mind to give willing, unselfish service?

The first step is to familiarize them with the business affairs of the company. In large organizations there is, many times, too much isolation of the various departments. The employees in one department are familiar with what is going on in their particular circle, but frequently they know little or nothing of what the organization is doing as a whole. For instance, a company may spend thousands of dollars for advertising its service and yet its own employees may not see its advertisements unless steps are taken to call their attention to that particular activity. An effective way to call the attention of employees to advertisements is to have proofs posted in all departments, offices, stations and other places where employees are at work.

To Please, Every Employee's Job

AS with advertising so with other activities within an organization. The employees should be given every opportunity to learn the business of the company by which they are employed. Because certain work or certain practices may affect one department directly, it should not be taken for granted that employees in other departments are not interested. Too often we see a spirit of "that is no concern of mine" because it affects directly another department. Anything which affects the interests of the company is the concern of every one connected with that company.

When every employee understands that a company is in earnest in its desire to please its customers and that it relies upon him to carry out its purpose, it gives him a new interest in his work. He takes pride in his company and feels that it rests with him to uphold its reputation. He feels his responsibility and responds accordingly. He thinks of himself as an important factor in the operation of a great human enterprise. He is a part of that enterprise and proud of it.

When that spirit permeates a whole organization it cannot fail to make its influence felt by every one with whom it comes in contact. It is the foundation of good service. Public good will is the key to successful operation of a utility company, and good service is the basis of public good will.

The Manager's Part

By EDWARD DANA
General Manager Boston Elevated Railway

The manifold duties of the modern manager require him so to plan his time as not to neglect important duties. A gain will follow the intelligent use of statistics and delegation of authority. Other managerial problems are discussed.

"MODERNIZATION," defined literally, means "the act of conforming to recent or present usage." As used by electric railway managers today it signifies more than that. The mention of the word suggests to them not merely conforming to usage but helping to create usage and to raise it to a higher plane. This involves knowing what is the best practice, making the most effective use of it under local conditions, and improving it as opportunity permits and ingenuity suggests.

A great and vital industry is at the moment intrusted to the managers of today as stewards and modernizers. The problem before us is to direct and develop it, and pass it on in a manner worthy of the traditions which have been handed down to us from previous periods of modernization effort. Ours is the duty of contributing as much as our predecessors did in bringing the industry to the position which it occupies today, or to do more than this if possible.

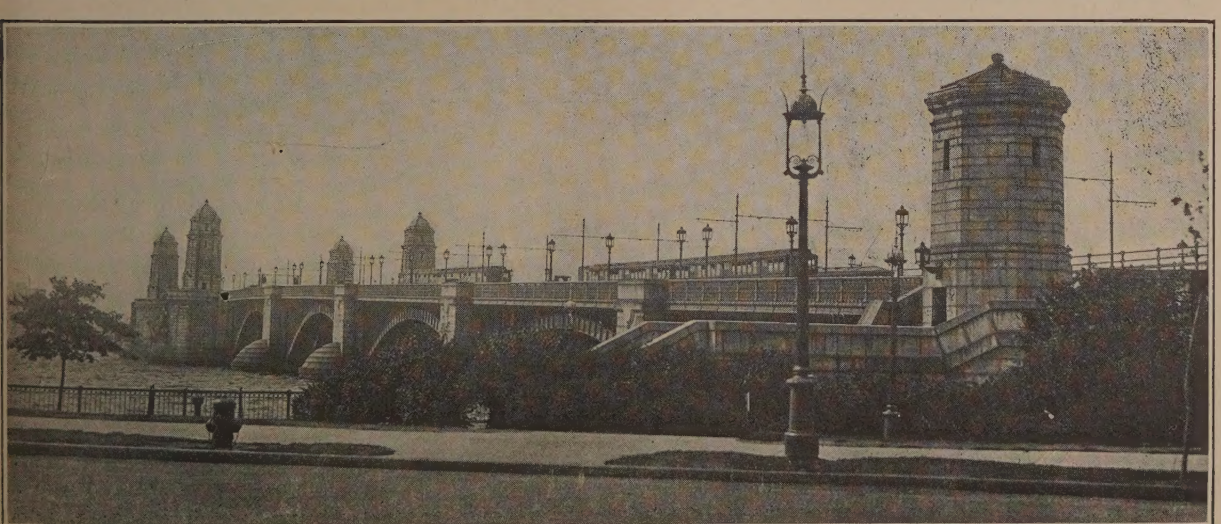
In deciding upon what is best in "recent or present usage," opinion will differ. But the differences are minimized through the operation of our national co-operative organization, the American Electric Railway Association, which acts as a balance wheel and, as one might say, integrates the work of individual managers in their modernization efforts.

As we glance back at the brief span of 40 years which marks the career of the modern electric railway, each milestone in the path of its remarkable development is seen to be a sign of timely modernization. The first electric railways were simply the horse railways electrified, potentially perfect but actually crude. One by one modernizing features were introduced, improving speed, comfort, economy, safety and general attractiveness of operation.

To my mind electric railway modernization can be represented by a curve like that accompanying this article, in which *a* represents the progress which is being contributed by our epoch and *b* represents that epoch. This progress, I believe, is greater than that which has been contributed in any like period before. The reason for this is that the economic chains (of which the 5-cent fare was one), which long held the industry in bondage, have been loosed, and greater freedom and opportunity is presented to those now in charge to produce results.

Various Views of Modernization

In order to discuss this subject intelligently we must ask ourselves the question: "What does the present-day manager think about modernization?" In other words, how does he orient himself amid the conflicting thought, improvements and other changed conditions of the industry existing at this time? In short, how does he judge of the realities and the needs of the time, and adjust his necessary service best to meet these needs? Right here we find widely divergent opinions.



The Cambridge Subway of the Boston Elevated Railway Crosses the Charles River on This Bridge

One manager thinks salesmanship, as applied to selling transportation, the key to modernization. Possibly he may see other factors; perhaps he worships at that shrine alone.

To another, publicity—and still more publicity—seems an obsession, and he regards it as the acme of modernization.

A third revels in camouflaged reduced fares, ticket fares and other cleverly devised methods designed to lower the average fare and thus induce more people to ride.

Still another manager aims at safety targets, no-accident "centuries" and the like. He appreciates the human suffering as well as the financial burden involved in the accident toll being taken from our generation.

Modernization to another manager means one-man cars, or, as have followed them in Darwinian style, "no-man" substations, which exemplify the fascinating advance being made in lowering power cost.

Still another is specializing in a grandstand play of wage reduction in the effort to get a scale that is economically commensurate with the decline following the period of rising cost of living and advancing wage costs.

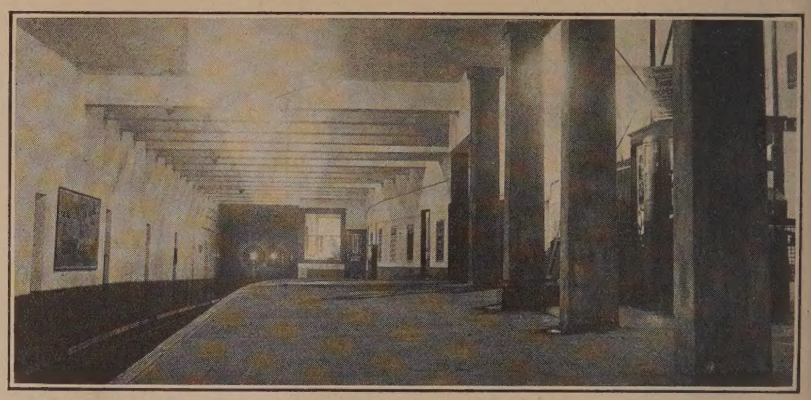
Again, some managers feel that municipal ownership, service at cost and the "all the cards on the table" method of improving the practical working of private operation under state regulation are the panaceas for electric railway ills.

To my mind there is virtue in all of these elements of modernization, and the viewpoint of the all-round manager should include them in their proper proportions.

After all, it is a matter of attitude. The manager must have an abiding conviction that the electric railway is a public servant, and as the nature of its service is much misunderstood he must have an enthusiastic devotion to an "under-dog" industry. As there has long ceased to be a place in the mouth of the utility manager for the words "the public be damned," so there must be no place in his heart for the thought "the public be damned."

The Use of the Manager's Time

A manager can accomplish little in modernization unless his time and attention are properly distributed. A busy manager may be carried first this way, then that, unless he checks himself as to whether some phases of his work are receiving too much of his time to the neglect and detriment of others.

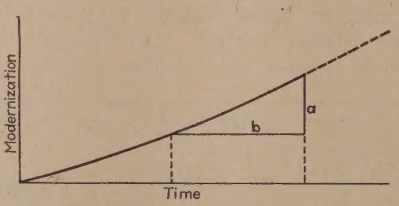


New Maverick Square Station of the East Boston Tunnel

Roughly speaking, an electric railway executive is called upon for attention to the following:

1. Transportation problems.
2. Departmental problems.
3. Legislative matters.
4. Regulation affairs (commission).
5. Requirements of the public.
6. Requirements of the president and directors.

While the real problem of operating the railway is embodied in the planning, checking and improvement of affairs covered by items (1) and (2), if an executive were to concentrate his entire attention upon them he would shortly find himself and his railway in very serious trouble. An executive cannot solve his problems in a private experimental laboratory.



The Curve of Railway Modernization

On the other hand, while it may be gratifying to an executive to be seen much in the legislative halls, or in the offices of the public utilities commission, he can get the best results for his railway by being on the job with the Legislature or commission only when it is necessary. At such times, by earnest, forceful exposition, he can secure respectful consideration, whereas he loses prestige by constant attendance at these places.

In dividing his time among these six major claimants, the executive will find that the fifth group, the public, can easily usurp a much greater portion than that to which it has a reasonable right unless he is careful. Modernization has made it necessary for him to give any and all comers as much of his personal attention as possible. But this swing of the pendulum to great freedom of access requires careful discrimination. Properly allocated and wisely selected, the minutes given to representatives of the public oftentime will yield a golden harvest, whereas poorly planned and hasty conferences may lead to no definite benefits.

Finally, the time which the executive needs to give to his president or directors is dependent more on their attitude than on his own. Certainly if the organization is functioning properly the president or directors will call for no more sacrifice of time on the part of the operating executive than is absolutely necessary to keep them properly informed and satisfied that good results will be forthcoming. One of the most trying experiences of an executive is to have his time diverted from important major matters by directors, or others, to relatively unimportant details. But the manager must be discriminating here, for the very effort of president or directors to know more of the details of the management is in itself proof of the complete spirit of modernization which has been growing of late years.

We may assume now that the manager appreciates the importance of wise distribution of his time and energy. It seems to me that this is more important than ever before, because the trend of modernization is forcing centralized authority into his hands. This is to eliminate delay in a direct public service which profits so much by equally direct action.

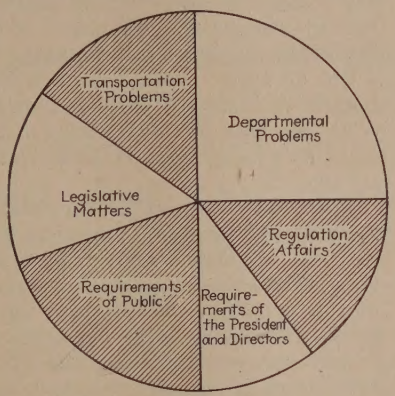
One of the factors which had much to do with creating adverse public opinion in former days was the time it took to investigate and report upon matters vitally affecting particular individuals. Modernization tends to eliminate this and secure direct prompt contact with those with whom business is being done. To this end a superfluity of departments or intermediate officials should be avoided. This adds emphasis to the managerial means of control.

The Use of Statistics

While a modern manager appreciates that to attempt to run the details of his department is to retard the progress and efficiency of his organization, nevertheless if he is to be capable of meeting trying situations, he must employ vital operating statistics to the best possible advantage. He must do this to furnish him the means of control in the shortest space of time to enable him to get results before serious damage has occurred.

To illustrate: There was a time when it was believed impossible to budget the income and expenditures of an electric railway because of the varying factors which enter. Today it is realized that once the problem has been resolutely tackled it is relatively easy to do so. The budget lifts a great burden from the shoulders of the manager because, at all times, he has a compass to indicate which way his ship is traveling.

Only a relatively few detailed statistics are necessary to keep the manager well informed as to the trends of his business and as to the efficiency of his departments. Fortified with such statistics, for instance, the manager, by his familiarity with the men on the payroll, wields a very stimulating effect upon department heads, even though his familiarity may not extend beyond the preliminary index figures.



How One Manager Divides His Time

However, the manager must be satisfied with general deductions from his data. He cannot follow out the details in all of the byways which open up to him in the mass of statistics which flow over his desk or can be made to do so.

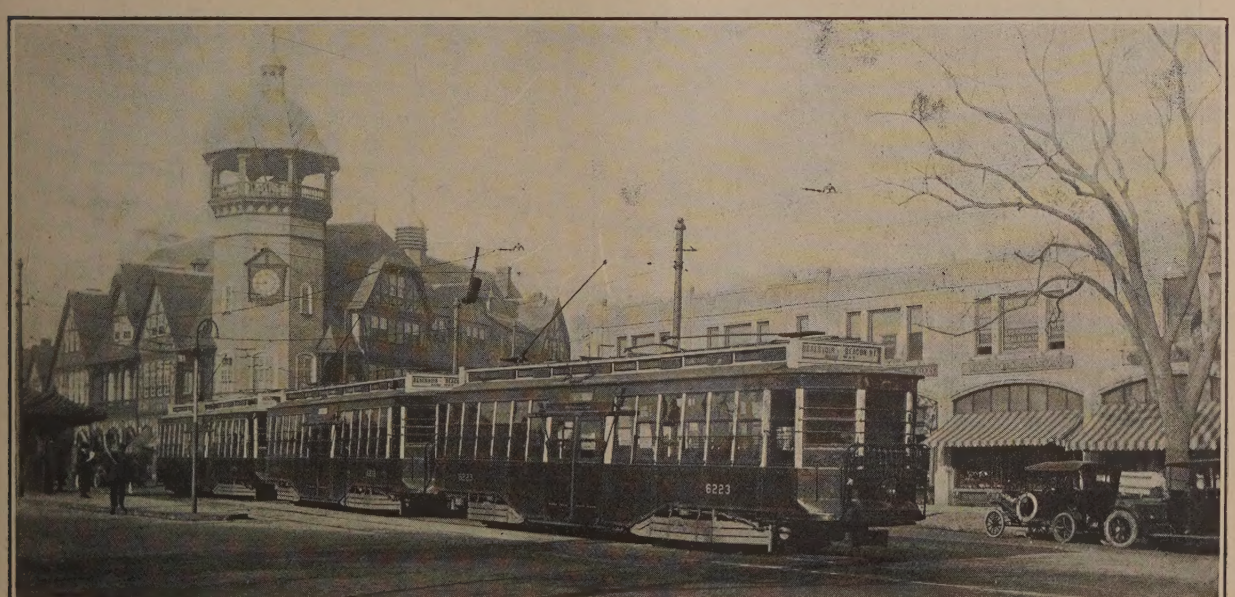
Delegating Authority

In the centralization I have referred to, I must not be understood as recommending the manager's absorption in detail. He must delegate most of the detail to others. But delegation of authority can be exercised only in proportion to the experience, competency and loyalty of subordinates.

I do not look upon the responsibilities naturally incumbent upon a department head as delegated by the management. Rather they go with the job. The manager's responsibility here is to select competent persons and to see that they get results. Their authority in their own departments should not be curtailed by interference from the management. What I mean by delegation of executive authority is the sharing with subordinates of the general manager's authority as such. He must delegate executive authority to some extent or he cannot carry his load. But if each department head is supreme in his own bailiwick, the loyal co-operative spirit of the departments will become so enmeshed with the management that such general executive responsibility as may be delegated will be assumed in such a manner that it is hardly noticed as such, and no harm can come therefrom.

The Most Pressing Problem Today

This matter of delegating authority is closely related to another one which has come up in the progress of modernization. I refer to the selection, training and education of the personnel. This is the most important task confronting the manager today. Here lies a field of pioneer work for modern managers.



A Modern Three-Car Center-Door Train on the Boston Surface Lines

While many devices have already been tried and found wanting in the effort to secure co-operation and intelligent workmanship, there are evidences on every hand that this problem is destined to receive more attention in the immediate future and along more fundamental lines.

Another Pressing Problem

Only second in importance among the large jobs of the manager of the future will be that of constantly improving methods of telling the story of the industry. Recently the New England Bureau of Public Service Information* called attention to the story of Joseph, the son of Jacob, who went down into Egypt, and through diligence and intelligence rose until he became the principal person in the state, excepting only the monarch. And then the story goes on to say: "And Pharaoh died and there arose in Egypt a new king who knew not Joseph." This was hard on Joseph's descendants. They lost favor with the ruling dynasty.

The ruling dynasty in regard to public service is the public. Through publicity, week in and week out, year in and year out, the public utility story must be told, because every day the people who know the story pass on and others come who do not know it.

*See also address by Bruce Barton before National Electric Light Association in ELECTRIC RAILWAY JOURNAL for June 9, 1923, page 967.

Every year general counsel and boards of aldermen, improvement societies and the car riders are subject to change. Consequently it will be the ever new job, and one of the most important jobs, of the manager to tell his story to the public.

Modernization in the broad sense has brought in public utility regulation by commission. This has done the utility no harm but probably a world of good. Before commission regulation came in earnest it was relatively easy for the manager to feel like a czar, even if he did not act like one.

With full commission regulation the manager has been obliged to secure the assistance and support of the commissions in properly operating his property. He no longer considers them as obstacles, but without in any way compromising the commission staff, virtually adds it to his own staff. This is possible because the function of the commission staff is simply to get the facts and act upon them intelligently. This is what the railway needs to do, also.

With co-operation the commissions will have no need to exercise the autority with which they are clothed. If they did they could become obstacles to the proper operation of the railway.

Obstacles

Modernization is, like all progress, subject to obstruction and criticism. This need give rise to no discouragement. Enthusiasm and constant effort toward a given end, backed up with convincing information, will in the long run wear away most of the obstacles which stand in the path of modernization.

One obstacle is found in the tendency to consider modernization theoretically, without due regard to practical economics. This leads to the weathercock practice of endeavoring to see how many new wrinkles can be discovered or how many schemes can be followed. Such procedure reminds one of the ignorant sufferer who, in trying to effect a cure, purchases at different drug stores a variety of quack advertised remedies.

Certainly the modern manager should be keenly alive, through the constructive efforts of the American Electric Railway Association and the helpful work of the technical press, duly to consider the conflicting tendencies of the time. He should cull from them, after analysis, those which appear to be sound practice and which are likely to result in improvement over the practice of the past.

There still seems to be too great faith in existing practices which while they have been satisfactory and have done no harm, might well be replaced by others which would work out ultimately to greater advantage. This faith, I regret to say is too often due to lack of a spirit of inquiry.

Attractive Architecture Features the Forest Hills Terminal of the Washington Street Elevated

Local Transportation

By JOHN A. BEELER
Director the Beeler Organization, Public Utility Consultants, New York City

The use of modern methods in street railway transportation, such as attractive equipment, good schedules and improved fare-collection practices, reduces operating costs and stimulates travel. Many companies can be made prosperous at a relatively minor cost.

STREET cars, subway and elevated railways, buses, coaches and taxicabs are today the principal types of conveyances employed in the local transportation field. Each has its own distinct place and value. The taxi, of course, is for quick individual service at a higher rate of fare. The bus and coach provide a form of public motor service that is particularly adapted to boulevards, parkways and other thoroughfares frequently not accessible to street cars. High-class coaches, such as those employed on Fifth Avenue, New York, and on the boulevards and avenues of Chicago and Detroit, have created a new type of service and patronage which has possibilities in many localities. This does not mean the promiscuous duplication of existing service, but rather a judicious employment of the various forms so as to expand the scope of such service without waste to the full requirements of the community.

In our larger cities the problem of making the streets safe for pedestrians is practically an unexplored field and one that must be given especial attention. The location of car stops, establishment of safety zones, loading platforms, parking control and regulation of vehicular traffic are important factors affecting the facility of the movements of pedestrians as well as their safety. Steps will have to be taken in the near future to minimize sidewalk congestion in many city districts. In co-ordinating the various types of transportation the requirements and safety of the pedestrians must not be lost sight of.

The street car, next to rapid transit subway or elevated lines, is the greatest factor in handling mass transportation. In the principal cities of the country to-day the street cars are carrying between 80 and 90 per cent of the total surface passengers and constitute only about 10 per cent of the vehicles on the streets. They are by far the most economical and efficient carriers, not excepting the elevated or subway. These latter, except in connection with great population densities and tremendous volume of business, are impracticable on account of their excessive construction costs.

Table I—Reequipping, Rerouting and Rescheduling a Street Railway System Serving 1,000,000 Population

	Old Plan	Revised Plan
Annual Operations:		
Annual operating revenue	$11,873,565	$13,107,699
Operating expenses, including taxes and renewals and retirements	11,718,953	9,084,667
Net before interest	154,612	4,023,032
Investment	45,048,711	51,448,711
Investment per dollar of revenue	3.80	3.92
Return on investment, per cent	0.34	7.82
Comparative Operating Statistics:		
Miles of track	146.20	139.60
Cars in daily operation	682	532
Car-miles	19,106,948	16,091,362
Car-hours	2,778,306	1,918,238
Car-miles per car-hour	6.89	8.38
Revenue per mile of track	$81,200	$94,000
Cents per car-mile:		
Operating revenue	62.1	81.5
Operating deductions	61.3	56.5
Net revenue	0.8	25.0
Dollars per car-hour:		
Operating revenue	$4.28	$6.84
Operating deductions	4.22	4.74
Net revenue	0.06	2.10

Buses can be used in many a locality that cannot support a car line and to augment and feed car and coach lines. They should not, however, be permitted to parallel immediately or to duplicate established transit lines that are rendering ample and satisfactory service. Many buses are to-day opening up new territory, while others, by duplicating service, are merely making it more difficult for the existing lines to operate economically and efficiently.

To secure the best results, all services must be co-ordinated in a local plan of transportation that will best serve the community, each class performing its own peculiar function. Each type should charge what the service is worth, based upon its cost and not upon all that the traffic will bear.

Modern Street Railway Equipment

Modern equipment requirements for service on city surface lines can be brought under three types of cars:

One-man safety single truck.
One-man safety double truck.
One-man, two-man double truck.

Motor vehicular service likewise is covered in three types, coaches, buses and flivver jitneys. I will not enter into details of the various types except to say that each should be light in weight, fully equipped with all advantageous automatic and safety devices, easy steps, wide and commodious entrances and exits, comfortable cross-seats facing forward, plain and sanitary inside finish and should be well lighted, with an attractive interior. The exteriors should be bright, preferably light colored, so that they may be more readily seen. The cars must be amply motored and equipped with brakes that will provide smooth and even retardation. Rapid braking and acceleration are of prime importance.

New and attractive equipment should not only reduce maintenance costs but should stimulate travel. Recently we observed a railway operating in a densely populated territory, where general traffic and business were good, that was showing a steady loss of patronage. One reason was the unattractiveness of its rolling stock. I recall an instance of a railway that was paying out an-

nually for maintenance and power amounts which annually would exceed charges to these items on new and modern equipment by more than 50 per cent of the first cost of the new equipment.

In analyzing a large street railway system that was badly run down it was found that 450 new modern standardized cars would meet the company's entire requirements. This called for junking of more than 600 old worn-out, inefficient cars of many types and varieties, to the great advantage of both the patrons and the company.

Think of the storage room released and the simplification of maintenance practices made possible, to say nothing of the advantages secured from the operation of attractive, comfortable and quick-acting cars on the streets. The best modern practice is toward standardization of efficient types, not only to bring about economies of operation but also to stimulate traffic.

In the matter of stops, many lines in city service could reduce the length of time consumed in making a stop approximately 5 seconds by substituting modern cars for the heavy and obsolete equipment with narrow doors, high steps and small platforms now in use. Another 3 seconds per stop could be secured by increasing the rate of acceleration and braking. This is a total of 8 seconds per stop saved, including the time lost in slowing down to the stop and in resuming free running speed. An average car will run 40,000 miles per year and make about 240,000 stops. A saving of 8 seconds per stop means a reduction in the cost of operating the car of $1,600 per year. This will pay the carrying charges, with interest at 7 per cent, on a new car costing $15,000 and leave a net saving of $550 for each car operated by the company.

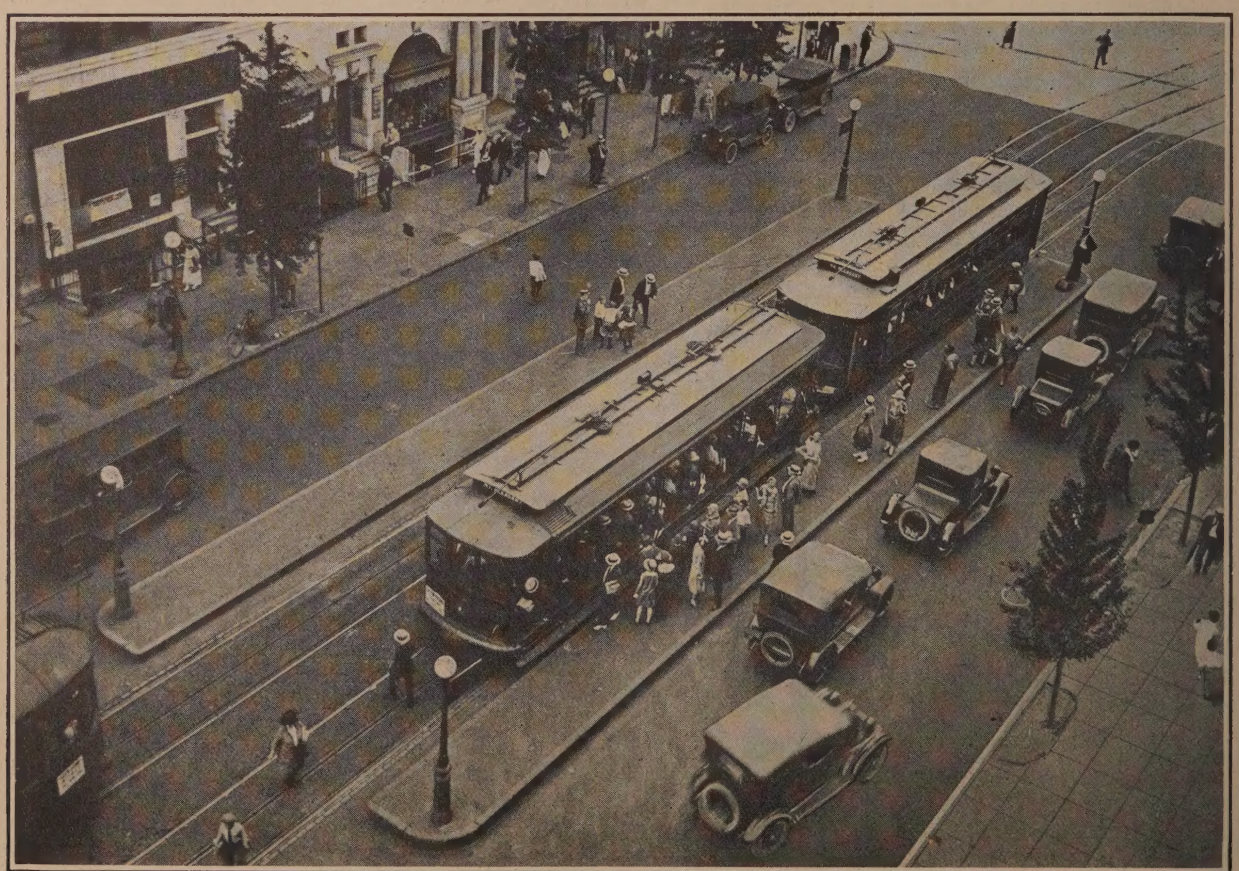
What new and suitable equipment and a general rerouting and scheduling can do to a railway system serving a population of upward of 1,000,000 is shown in the comparison of operations in Table I.

The net result expressed in dollars and cents is shown by the increase in the earnings applicable for interest from $155,000 to over $4,000,000, raising the return on the investment from less than one-half of 1 per cent to nearly 8 per cent.

The results of the almost universal swing from far-side to near-side stops a decade or more ago have demonstrated that neither plan is entirely satisfactory as a hard and fast rule. The many difficulties encountered under the far-side method confirmed this. To-day it is evident that the selective plan is preferable. Stop locations should be carefully studied and established only after considering all the factors that are involved.

Stop Locations Important

The near-side stop plan caused a general slowing up of schedules. Vehicular traffic usurped the right of way and made the cars slow up at crossings whether they were stopping for patrons or not. Where the far-side stop is in use it is known definitely that when a car appears it is going to cross the intersection. Consequently there is little excuse for an attempt on the part of the vehicle driver to beat it to the crossing. Far-side stops, except at controlled streets, tend to permit of



Permanent Loading Platforms Such as These in Fourteenth Street, Washington, Save Time for Car Riders and Speed Up the Car Service

making better time by the street cars and to result in fewer accidents.

In the matter of the location of passenger stopping places, the best practice covers the following features:

Spacing should be close enough to accommodate passengers, but far enough to permit a reasonable schedule speed. An average of eight stops to the mile in the business and well built up residence sections is generally recognized as desirable for surface cars and buses.

At junctions, stops should be made before entering the joint tracks with heaviest traffic. Often much can be gained by merely shifting a stop across the street. The location of individual stops is not only important to the operation, but the correct location will benefit the patrons and diminish the accident hazard.

The advantage of eliminating unnecessary stops is threefold, for the number of stops made determines to a large extent the amount of service that can be given with the available track and equipment, the time required to reach the desired destination and the cost of the service.

In one community of less than 200,000 people it was found possible to save an average of one stop per mile of route by respacing the stopping places. This represented a saving of $100,000 annually in the cost of operation. In New York City the saving of an average of one stop per mile by the surface cars last year would have been equivalent to $1,750,000.

Double Berthing at Important Stops Saves Delay

Double berthing of cars saves time, for it eliminates stopping more than once at a stop location. Many companies now use this principle, but oftentimes they do not follow it rigidly enough to secure its advantages. Double berthing means loading and unloading passengers by two cars at one stop location. The first car should always stop in the forward berth, and the second car approaching should pull into the second berth behind the first car without hesitancy and proceed to load and unload its passengers. It should then continue to the next regular stop location without making any further stops. This practice, if it is done correctly, enables two cars or even two sets of cars to pass through an intersection on one signal of the traffic officer and results in the minimizing of bunching and in relieving congestion to a marked extent. A result that seems almost contradictory is that with double berthing established, the need for it seems almost to disappear. It also has a direct monetary value which, though secondary, is important. In the downtown section of a city of some 400,000 population observations made indicated a saving of from $250 to $500 annually for each location thus treated.

Safety Zones and Loading Platforms

Clearly defined safety zones should be established at all heavy loading points. Or better, by far, in wide streets permanent loading platforms should be installed. This will shorten the length of passenger stop, as it has the effect of eliminating one step onto the car when boarding and alighting. It also provides a safety island where passengers will congre-

On Pennsylvania Avenue, Washington, Where Parades Are Frequent, Loading Platforms Are of Wood and Are Removable on Short Notice

gate and be ready to board the car as soon as its doors open, for they know definitely where the car will stop. There should be no difficulty in locating loading platforms with a double-track car line in streets which are 60 ft. or more wide between curb lines. On streets narrower than this individual conditions enter into the desirability of using platforms. If street car loading is heavy and vehicular traffic light loading platforms would still be desirable. Platforms should be long enough to accommodate two cars, should be 5 ft. wide and 9 or 10 in. above the rail. The inner side of the platform should be about 24 in. from the outer rail. Street widths are frequently such that platforms can be employed without reducing the number of traffic lines. In other words, the platform will occupy what otherwise would be waste space in the roadway.

Observations have shown that platforms under average conditions not only permit of a more rapid flow of vehicular traffic but speed up car loading about one-fifth of a second per passenger. While the monetary saving here is secondary, it has a value. On a platform loading but a thousand passengers per day a saving of $60 annually is obtainable, which will pay a good rate of return on the cost of the platform. One from which 3,000 load daily will save $180 annually, and so on in proportion.

Coaches and buses usually stop next to the curb. Under heavy traffic conditions, such as encountered on Fifth Avenue, this is often impracticable. Under no circumstances, however, should their regular loading places be alongside of a street car safety zone or platform.

Vehicle Parking Should Be Controlled

Parking of vehicles along main thoroughfares has been and is the cause of much congestion in cities of over 100,000 population and in many of the smaller communities. Parking as now practiced frequently results in serious disadvantages to moving vehicles. There is no logical reason why the first driver to come on the street in the morning should preempt public property to his own private and personal use for the entire day or such portion of it as he may desire. Such a plan is of great detriment to the merchants and business men. Dead cars parked all around their stores drive legitimate customers away. What is wanted is a stream coming and going continually. It must be remembered that the streets are primarily for moving traffic and not for storage purposes.

Parking should not be permitted on any street carrying an important car line unless there is a roadway of at least 17 ft. between the outer rail and the curb line. Where there is an appreciable volume of vehicle and street car traffic parking should not be permitted unless there is ample room for two lines of moving vehicles between the parked car and the street car. Parking should not be allowed opposite or within 25 ft. of a car stop location or within 75 ft. of the intersection of two street lines. In all cases, unless it be an extremely wide street, cars should be parked parallel to the curb and on the right-hand side of the street in the direction in which they are headed. Parking spaces should be marked distinctly as such and the parking regulations should be strictly enforced.

Fares and Fare Collection

Given the right to do business, the cost of service is largely dependent on eight principal factors, as follows:

Efficiency of management.
Rate of wages paid.
Cost of supplies and fuel.
Taxes, including paving requirements.

Table II—Operating Survey of a Street Railway System Serving 175,000 Population

Annual Operations	Old Plan	Revised Plan
Operating revenue	$2,042,000	$2,107,000
Operating deductions	1,683,000	1,505,000
Net revenue	359,000	602,000
Comparative Operating Statistics:		
Miles of track operated	83.64	84.98
Cars in daily operation	174	152
Car-miles	6,525,000	6,360,000
Car-hours	719,800	655,000
Car-miles per car-hour	9.09	9.72
Revenue per mile of track	$24,400	$24,800
Cents per car-mile:		
Operating revenue	31.3	33.1
Operating deductions	25.8	23.6
Net revenue	5.5	9.5
Dollars per car-hour:		
Operating revenue	$2.84	$3.22
Operating deductions	2.34	2.30
Net revenue	0.50	0.92

Interest rate.
Speed and length of haul.
Type of equipment employed.
Volume of business.

These factors will fluctuate from year to year and vary considerably in different communities. I know of railways doing well on 5 cents and others losing money at 10. There can be no such thing as a universal flat rate that is applicable to all properties regardless of the foregoing factors.

Any service that is satisfactory and of permanent value to the community must be based on sound finance, and the income must be sufficient to cover the total cost of service, including a reasonable return on the investment. The average rate of street car fare to-day in this country is approximately 7 cents; coach service is 10 cents, and bus fare is about 6⅔ cents. Where public dissatisfaction exists very little, if any, complaint is in evidence as to the rate of fare. It is generally with reference to the quality of service rendered.

Odd cash fares take more time for change making, congest the car entrance, consume the patron's time and slow down the service. All of these things are expensive and detrimental to good service. The trend in fares is toward even money. The ideal arrangement is for a straight 5 or 10-cent cash fare, with intermediate rates obtainable through the use of tokens or tickets. The sales units should be large enough to cut down an excessive number of transactions and small enough to attract all regular patronage to buy tokens, but should be in easily handled units. Twenty-five cents makes the ideal sales unit, but there should be nothing to prevent the purchase of larger quantities when a patron so desires.

The method of fare collection should be made as easy and rapid as practicable. Hand collection has its advantages in platform payments, for then the responsibility for collecting the proper fare is fixed absolutely upon the collector. He is the official salesman for the company. This safeguards the receipts. With proper registration, which should be based upon the cash register principle, the earnings are doubly protected. Each fare should be registered under its individual classification and receipts should not be simply lumped by being rung up as so many fares, any more than a merchant would lump his daily transactions under the head of so many sales.

Prepayment areas are desirable where practicable and such automatic devices as the featherweight turnstile are most efficient under special conditions. All operators know the difficulty of checking platform fare box collection; the fare

box must be continually watched and tripped. Where locked fare boxes are used, however, a registration is useless as it makes unnecessary work for the trainmen when their time could be employed to better advantage, such as watching the boxes more closely or in looking after the wants of passengers. No one will ever know how many millions of dollars have been lost during the past few years from the dropping of odd pennies in the fare box instead of the full fare.

Making Schedules to Increase Speed

With modern equipment, properly placed stops, the co-ordination of the movements of other traffic with that of the street car and reasonable vehicular traffic and parking regulations schedules can be revised to take advantage of quicker loading and unloading, faster braking and acceleration and freer movements generally through the streets.

A scientific revision of schedules should have the result that less equipment will be required to do a given amount of work, that each unit will render more car-miles of transportation per day or per hour and that first costs will be reduced, as well as interest charges and operating expenses.

It has been truly said that schedules make or break a company. Hence the tendency to-day is to give close attention to this most important department. One of my first experiences as an operator was in raising the average schedule speed of the system then in my charge from 8 to 10 miles per hour. It was made in the face of much opposition and apprehension, mostly from our own officers and employees, and required a period of more than a year to consummate fully, as many lines were involved. When finally accomplished, it was found that the railway had increased its range of usefulness, traffic had been stimulated, accidents had decreased and operations were much more effective and economical. The operating ratio had dropped from around 90 to 65, showing that by employing better schedules 25 per cent of the gross revenues had been conserved. This was sufficient to add several millions to the market value of the railway's securities.

The great demand to-day in all lines of transportation is for quicker service, increased safety and greater comfort. Cost is an important factor, but both cost and safety (I am sorry to have to include the latter) are regarded as secondary elements by many. This is illustrated daily by the huge death toll resulting from the reckless use of the motor vehicle, now so prevalent from one end of the country to the other.

Public transportation, to be financially practicable, must be safe. Quicker service is possible with safe speeds by reducing the time wasted in making unnecessary stops and in delays. Wide-awake transportation agencies are alive to the demand for time saving. Any system where the service is becoming slower is slipping and should take account of itself at once, for unless this factor is corrected quickly its days of usefulness are about over.

It is indeed difficult to overestimate the importance of many matters that appear as of minor importance. For instance, the saving in time obtainable due to raising the rate of braking and acceleration on a line from 1 to 1.5 m.p.h. per second will increase an average schedule about 12 per cent. What has been accomplished in a community of 175,000, largely by eliminating or minimizing time losses, delays and service duplications, is illustrated by the comparative figures that are shown in Table II.

It will be noted that practically the same number of car-miles are furnished under the new plan as under the old. This service, however, has been so placed that it serves more riders and serves them better by transporting them more quickly. This, combined with some general operating economies, results in an increase of net earning capacity from $359,000 to $602,000 annually.

A More Liberal Public Policy Is in Sight

The tendency generally by the authorities is in the direction of a more liberal policy toward tractions. The advent of the bus is partially responsible. The latter uses a roadbed furnished at public expense. Otherwise, few bus lines could afford to run.

It is more clearly evident to all that the trolleys must be relieved of excessive special assessments for paving and other public improvements if equity is done the car rider. There is little room for argument on this. The trend is toward equality in taxation with such items of expense minimized to both types of service in order to maintain good transportation at a reasonable cost. This is of the utmost importance to the social and commercial welfare of all live communities.

Comments on Foreign Report

AMERICAN ELECTRIC RAILWAY ASSOCIATION
Office of the President

NEW YORK, Sept. 15, 1924.

I think your committee has performed a very valuable service to the electric railway industry. It is well to know from an authoritative source just what the relative conditions pertaining to our industry are in England and France. I have no doubt that the experience which the committee gained from this trip will be of great benefit to the electric railways of this country in furnishing suggestions and ideas which will be forthcoming long after the report has been laid aside.

BRITTON I. BUDD.

STEVENS & WOOD, INC.
Engineers

NEW YORK, Sept. 23, 1924.

To illustrate how much I appreciate your report on foreign conditions it is only necessary for me to say that last night I read the issue of the JOURNAL from cover to cover.

In talking with some of the members of the committee I got the impression that they felt the trip was to a certain extent disappointing—that is, that they did not find as much of interest as they had hoped. They may be justified in this disappointment if they set their expectations too high, but to me the report is all and more than I expected and very much worth while.

The value of this report is not necessarily found only in the suggestions of the committee, but a feature of equal importance to me is the opportunity it gives, that is, the inspiration, one might say, for suggestions which are more applicable to one's own problems. To me, this report was very meaty from that standpoint, and I thank you and congratulate you. R. P. STEVENS.

Railway Franchises

By W. H. MALTBIE
Consultant on Public Utility Valuation, Rates and Taxation, Baltimore, Md.

Commission regulation has changed economic theory and the law on which a franchise rested. A modern franchise therefore should not be constructed by wholesale borrowings from older franchises but should be drafted so as to be in full harmony with present-day conditions, both legal and economic.

WITHOUT attempting an elaborate legal definition of a franchise, we may say that in the last analysis a street transportation franchise is practically a contract between a municipality or other political unit, acting as agent for the public, and a transportation agency, providing for the rendering of service by the transportation agency to the public, represented by the granting political unit.

This franchise contract, in common with all contracts:

1. Must be within the contractual powers of the respective parties.

2. Is to be construed in accordance with established legal precedent and as if it contained certain special covenants which the law assumes to have been included.

3. Must rest upon some consideration moving from the political unit to the transportation agency, usually the right to the use of the streets, exclusively or otherwise; the right to collect compensation for the service as rendered, and the power of eminent domain.

4. Must rest upon a consideration moving from the transportation agency to the political unit, usually the promise to render service, to which there are frequently added other considerations such as the payment of an easement tax, the assumption of paving burdens, and numerous other items.

5. Must show definitely the nature of the service to be performed and the conditions under which it is to be performed; or, if this is not practicable, must set forth some method by which this nature and these conditions can be definitely determined from time to time.

6. Must provide definite compensation for the service, or provisions for making this compensation definite from time to time.

7. Must provide for the ultimate termination of the contract and the adjustment of the respective liabilities of the parties in event of such termination.

While such an outline as this is relatively simple, an actual franchise, covering very complicated services to be rendered over a period of years under probably varying conditions and involving enormous expenditures of money, is necessarily complex; and the difficulties which arise in operating under such a contract lead frequently to court interpretation and adjudication. As a result, there has been in the past a marked tendency to copy from an existing franchise those provisions which have received a satisfactory court interpretation and to develop safeguards that are supposed to meet the difficulties that have arisen while operating under other forms of contract.

In consequence of all this, the franchise has now become an extremely technical and complex document made up largely of court tested sections borrowed from previous franchises, and it forms a satisfactory basis for practical operation only in those cases where it is the product of high-grade technical information, a broad knowledge of the economic field, practical common sense, and high-grade legal draftsmanship.

Many other important documents are built by this same borrowing process. State constitutions, city charters, bond mortgages, deeds, leases and similar documents have thus reached their present form and, granting one essential condition, there is perhaps no safer or better method.

This one essential condition is that the economic theory and the legal basis on which the document is to rest must be the basis underlying the document from which it is proposed to borrow. So long as testamentary law, for example, remains unchanged no good attorney attempts to be original in drawing a will.

But if the basic economic theory or the basic law which underlies a document is changed in such a way as to affect its operation, it becomes the height of folly to adopt a form or a provision without first determining whether or not it is a desirable form or provision under the changed economic conditions or changed law.

Such a change in basic economic theory and in basic law came about with the adoption of commission regulation, and with the adoption of commission regulation practically all of the then outstanding franchises became unsafe models for future draftsmen. A single illustration will make this statement evident. Prior to commission regulation the usual franchise fixed the rate of fare, and whatever the stockholders could make out of this fare over and above the cost of operation became their property. Therefore, any cash payments that could be exacted for franchises; any special taxes; any street paving, sprinkling, or cleaning burdens; any free service or other concession was a direct levy upon the stockholders, could not be passed on by them to the riding public and resulted in reducing by so much the burdens of general taxation.

With the adoption of commission regulation the fare ceases to be the

fixed point, and in its place the net return becomes the fixed point about which the rate structure is constructed. It follows immediately therefore that all burdens placed on the transportation agency are at once passed on to the riding public. It is evident, we think, that it would be unwise to take any franchise written under the original theory as a model of construction under the new.

The adoption of the new system of commission regulation therefore opened the door for originality in franchise making. This new system has been in force generally throughout the United States for a relatively short period; but we have now accumulated a considerable body of law, interpreted by decisions of state and federal appellate courts, so that while much of detail is still uncertain the broad principles under which the system operates and the general economic and legal theories under which the courts will interpret and restrain commission action are fairly well established.

It is therefore entirely proper for a student of the subject to examine this question of franchises *de novo* and attempt to formulate a franchise consistent with the present economic and legal basis on which it must rest and by which it must be interpreted. If he is wise, however, he will regard the results of such a study as nothing more than a basis for discussion and criticism by others.

Comparisons of Existing Types

Let us assume, therefore, that we have been asked to act as consultants in the drafting of a new franchise for a transportation company in a modern city, in a state where transportation is under the supervision of a public service commission with broad powers, that we have but two objects in view: first, to protect the interests of both parties, second, to produce a practical working document.

Here, then, is the situation. The municipality desires mass transportation. The company is ready to furnish it. The contract is to cover the terms and conditions.

One of the first points that comes up in any service contract is the question as to whether compensation for the service shall be on a cost plus basis or for a flat price. An enormous amount of paper has already been used in printing criticisms of the cost plus basis, and it is necessary here only to state the principal objection, namely, that this form of agreement offers no incentive either to economy or to efficiency of operation.

Unsoundness of a Permanent Flat Rate

On the other hand, a permanent flat rate for service is theoretically unsound because:

1. Changing economic conditions may make it impossible to render a satisfactory service at this rate and may lead to the abandonment of the enterprise, since private capital cannot be required to continue operating under a deficit but may at any time choose the alternative of a receivership.

2. The uncertainty of the profits to be made by a transportation agency under a flat rate makes the enterprise as to its stock, and even to some extent as to its bonds, a speculative rather than an investment proposition, thereby hampering it in its financial program, increasing the cost of money, and under some conditions rendering it impossible to secure the necessary funds for subsequent expansions which must be provided for in any growing municipality.

3. The flat rate is a direct invitation to the management to carry skimping of services as far as possible without reducing net return, and has a direct tendency to prevent the transportation agency from keeping pace with the development of the art.

Entirely apart, however, from these theoretical considerations the permanent flat rate contract is beyond the contractual powers of the parties where transportation is under the control of a public service commission with broad powers.

There is perhaps also a doubt as to the power of the municipality and the transportation agency to enter into a contract for service at cost plus a fixed return upon investment, but there is relatively less danger that a commission or a court will upset a contract of this sort than there is in the case of a permanent flat rate contract.

The real choice, therefore, lies between (1) a service-at-cost franchise in which the transportation agency is allowed to collect its operating costs, taxes, depreciation, and a fixed per cent upon its invested capital, the rate of fare changing automatically in order to keep gross receipts approximately equal to the sum of these items; and (2) operation under rate schedules which the commission may correct if they become unjust, unreasonable or discriminatory, but which the commission may not reduce to the confiscatory level.

Each of these forms has its advantages and its disadvantages. The service-at-cost plus plan, as previously noted, offers no particular incentive to economy and efficiency of operation. Economy and efficiency can be promoted either, first, by seeing to it that the employees render full service, that supplies and materials are not wasted, that the plant is kept in proper repair and made to render full service; or second, by the introduction of improved machinery and the adoption of various devices, original and borrowed from other companies, by which operating costs per unit of output may be reduced and the comfort or quality of the service increased.

The first of these methods of securing economy and efficiency may be reasonably safeguarded by the creation of a supervisory board or official on the part of the municipality who shall keep a constant check on the actual operations of the company; but the full performance of this function calls for a man, or usually men, of broad experience in the transportation field whose services command a price very much in excess of the amount which a municipality is in the habit of paying. Moreover, the exercise of this authority brings the municipality too far into the management field and encourages the company to pass over to the municipal representative the responsibility for efficiency.

The second method demands a keen, active interest on the part of every member of the transportation staff. This interest must spring from within the organization and cannot be imported to it from the outside. The municipality cannot secure it unless it creates its own operating staff and thereby practically doubles the administrative expense of the enterprise.

The occasional success of an experiment of this kind is no proof of the unsoundness of the statement above, but merely an illustration of the fact that some transportation agencies will work for efficiency without the promise of financial re-

ward, and of the further fact that love of the work and an appreciation of the importance of public service sometimes enable a municipality to obtain high-grade service for inadequate compensation.

If we are to frame a franchise, however, which is to be in force for many decades and extend throughout the life of several generations of transportation employees and municipal office holders, we must deal with human nature as it is and not as we would like to have it. Moreover, fairness demands that improvement of service, whether brought about by a man or a corporation, shall draw a greater compensation than mere performance of an allotted task, however faithfully done.

Method of Promoting Efficiency

Various methods of promoting economy and efficiency under service-at-cost franchises have been suggested from time to time. Probably the most practical one is the one by which the rate of return is increased as the service charge is decreased and conversely. In other words, the net return of the enterprise is on a sliding scale corresponding to changes in the scale of rates.

Given economic conditions generally static, this will be probably a satisfactory method of meeting the problem, but under such conditions as those of the World War it fails completely to meet the need. It assumes, of course, that increases in the operating cost of a service unit can be prevented by intelligent and efficient operation and that decreases in operating cost are the result of such efficiency and economy. But if a general change takes place in unit costs so that the actual expense of operation undergoes an advance, the charge for service must be advanced accordingly, and if the ability to secure new capital is to be maintained the net return should increase rather than decrease. On the sliding scale principle, however, such an advance in service charges would result in a decrease of rate of return and the credit of the company would be weakened at the very time when it should properly be strengthened. This difficulty might be met by introducing a new factor into the rate structure, such as the general purchasing power of the dollar or preferably the composite price index of street railway operating materials and labor. Under this modification the sliding scale of net return would not be based upon the rate scale but upon the relation of the rate scale to the price index.

The advantage of this method of regulating service charges is that the speculative element is almost entirely removed, the enterprise comes into the straight investment class with practically a public guarantee of a given return. As a result, bond capital can usually be secured at a low rate of interest, and if the contract includes interest charges as an expense rather than as a part of the return the public is immediately benefited by a reduction in the cost of service. Moreover, this method produces practically a public partnership relation with the utility, resulting in a public co-operation in the promotion of satisfactory service conditions, such as the prevention of jitney competition, the elimination of unnecessary street obstruction, and a willingness to dispense with extravagant service and unnecessarily luxurious equipment.

Rates Under Commission Regulation

Under commission regulated rates there is a stronger incentive to economy and efficiency of operation, since they result in a direct financial reward to the management in that they increase the net margin possible under the authorized rate. Moreover, the municipality is freed entirely from the necessity of exercising managerial duties and yet retains in the periodic commission investigation an opportunity of determining whether or not the service is rendered with reasonable efficiency and economy. The discretion of the commission in fixing rates covers a rather wide range between confiscatory levels on the one hand and the value of service on the other, and the far-sighted commission will seize this opportunity to force efficient operation by rewarding its presence with a high rate and punishing extravagance with a rate more nearly approximating the confiscatory level. This plan leaves, however, something more of the speculative element in the industry and therefore has a corresponding tendency to increase the cost of money and make the financing of improvements and extensions more difficult.

Theoretically, commission control should give as great stability to the income as the service-at-cost system, but commissions are not always wise and commission relief frequently lags behind necessity, so that capital with its proverbial timidity will probably ask a somewhat greater return under this system than where there is a definite municipal guarantee of a fixed return.

Moreover, while such public co-operation as reduces the cost of service ultimately reacts upon the rate just as inevitably under the commission rate system as under the service-at-cost system, the relationship is less direct and immediate, is not so clearly understood by the general public, and public co-operation is therefore apt to be less effective.

A Suggested Form of Franchise

The modern franchise may therefore reasonably adopt either one of these two theories. The writer would prefer at present a modified service-at-cost franchise, with the sliding scale of return to promote efficiency, with protection against change in the purchasing power of money and against one other contingency to be hereafter noted. The parties to such a franchise contract must be sure, however, that it is enforceable under the local laws, since otherwise either party, after operating for years under conditions less favorable than those under the commission plan, may find the contract repudiated by the other party merely because the relative advantages of the two plans are reversed. Under such a system as this, capital is sure of its return if it provides intelligent management and is increasingly rewarded as the management becomes more efficient; the municipality is freed from managerial duties; the reduction in rates through effective public co-operation is instantaneous; and the industry is safeguarded against economic changes which might result in a decrease of reward in spite of an increase in efficiency. So far as we are aware no such franchise has yet been written.

In the concluding installment of this article, to be published next week, the author will outline the provisions which should be included in a franchise of the kind just mentioned.

Rolling Stock

By J. C. THIRLWALL
Railway Engineering Department, General Electric Company

Smaller wheels have reduced car weights. The single-truck car has certain advantages. Relative merits of center doors and end doors are discussed. Lighter cars are being used on rapid transit lines. Trend toward luxury is noticeable on interurbans. Some railways are making the seats more comfortable.

MARK TWAIN once observed that "It takes a difference of opinion to make horse racing profitable." He might have added that individuals who are interested in horse racing sometimes find their opinions extremely unprofitable. The same enthusiastic difference of opinion as to the respective merits and demerits of various car and equipment designs is found in the electric railway industry. Moreover, an ever greater profit or loss may follow when money is spent to put these ideas into practice. For an impartial observer to pick out from the great variety of designs those which represent the best thought along the lines of modern practice is a difficult task. Nevertheless, there are certain fundamentals upon which the operating and designing engineers are almost unanimously agreed, and which are reflected in a majority of the cars recently purchased.

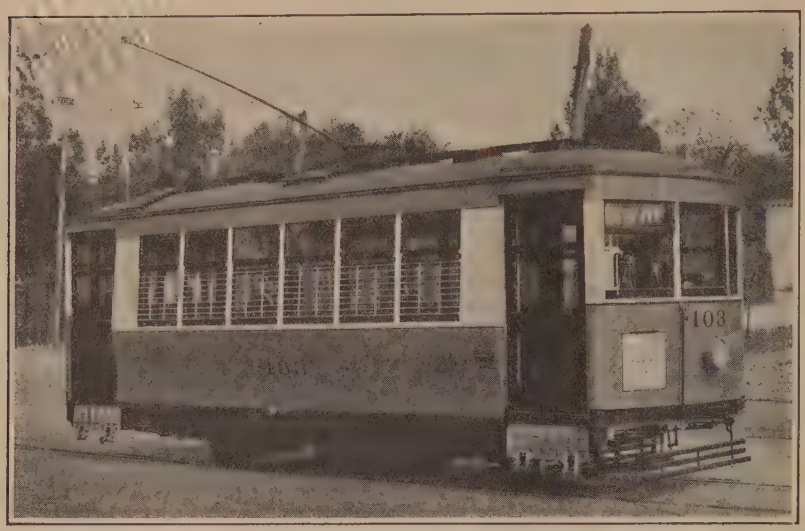
For city cars the high wheel truck has been discarded, with very few exceptions, in favor of the 26-in., 27-in. or 28-in. type, permitting either a reduction in step heights, the elimination of the drop platform, or both. The New Orleans Public Service, Inc., was the only large urban company that purchased 33-in. wheel equipments during the past year, while the most recent cars in Philadelphia, Chicago, Brooklyn, Detroit, Boston, Pittsburgh, Cincinnati, Los Angeles, Cleveland, St. Louis, Atlanta and many other cities use low wheel trucks.

Even in the interurban field there was a decided movement in this direction and the majority of such companies buying new passenger cars specified wheels of 26 in. or 27 in. diameter. This was mainly among the moderate speed roads however, the high-speed lines preferring to keep platform heights the same as on their existing equipments. But several complete installations were made of low wheel cars on roads that have free running speeds of more than 45 m.p.h., and which may, therefore, be considered well above the moderate speed class.

The reasons for this trend are numerous, and all of them in accord with sound engineering principles. The primary desire was to facilitate passenger movement by a reduction in the height between the ground and the floor of the car. In most instances this takes the form of eliminating the step from the platform into the body of the car. This saves time for the passenger and reduces the number of falling accidents. It also makes possible a stronger and lighter body construction, by permitting the extension of the longitudinal sills to the bumper and cutting down the overhung weight of heavily reinforced platform knees. The weight thus saved in the body of a double-end car amounts to about 500 lb.

But it is in the trucks and motors that the biggest saving in weight is obtained. For a city car, two trucks with 6-ft. wheelbase and 33-in. wheels weigh from 13,000 lb. to 14,000 lb. Even the more modern type, designed for small motors and using a 4-ft. 10-in. wheelbase with 33-in. wheels, weighs about 12,000 lb. per pair of trucks. The same

Greater Comfort for Passengers in Single-Truck Safety Cars Has Been Secured by the Use of Plush Seats by the Knoxville Power & Light Company



A Rear-Exit Door on a Single-Truck One-Man Car Relieves Congestion at the Front End

design with 26-in. wheels and a 4-ft. 6-in. wheelbase, suitable for use with 25-hp. motors, weighs about 10,000 lb. per pair. Many trucks now in service weigh even less than that. In other words, smaller wheels require a lighter truck frame, and the wheels themselves weigh materially less, the combined savings amounting to from 1,000 lb. to 1,500 lb. per truck for city cars and 2,000 lb. or more per truck for cars in interurban service.

The modern high-speed motor, built for use on the low wheel truck, accomplishes further weight reduction. Four 35-hp. machines with a working capacity practically equivalent to that of four of the old GE-80 or Westinghouse 101 type save between 5,000 lb. and 6,000 lb. per car. In the first place there is a saving of approximately 400 lb. per motor for the low wheel type as compared with the high wheel type which requires a longer gear center and heavier frame. Moreover, the weight reductions in the body and truck combined frequently permit the use of 25-hp. motors, thus effecting a further reduction of about 1,600 lb. per car. Additional savings are made in the weight of the truck frame.

The combined results are seen in the 48 to 50-passenger cars used in city service by many New England railways. They are equipped with four 25-hp. motors on 26-in. or 27-in. wheels, and weigh from 28,000 lb. to 32,000 lb. as compared to 43,000 lb. to 52,000 lb. for the older types of similar capacity that are now being retired. Even lighter cars of the same general type have been put into service by the Stone & Webster properties in the South, and by a number of moderate speed interurban roads in the Middle West.

For city service in Detroit, St. Louis, Cincinnati, Atlanta and Providence and on a considerable number of moderate speed interurban roads 35-hp. motors were selected together with 26-in. or 27-in. wheels for cars seating 48 to 54 passengers, and weighing from 32,000 lb. to 37,000 lb. In Philadelphia and Chicago the latest cars using two 60-hp. motors and 28-in. wheels weigh from 35,000 lb. to 38,000 lb. All of these show very material reductions in weight per seat from the older types used on the same properties. The biggest part of the saving is unquestionably due to the low wheel equipment.

The economies in operation resulting from this weight saving are material. In the first place, the cars and equipment can be purchased at a lower price, thus reducing fixed charges for interest and depreciation. The reduction in energy consumption is almost directly proportional to the weight, thus reducing both the annual power bill and investment in power house, substation and line. The maintenance of equipment and maintenance of track costs

Many Low-Level, Light-Weight Cars Similar to This Car of the Union Street Railway, New Bedford, Are Now Used in City Service

The Latest Multiple-Unit Cars of the Chicago Surface Lines Are Equipped with Automatic Exit Doors at Both Ends

are both favorably affected, and there exists good evidence that the life of track is largely governed by the ton-miles moved over it.

The actual annual economies effected will vary on different properties, being largely governed by the annual mileage per car, by the cost of power generation, etc. But it is interesting to note that the engineers of the Boston Elevated Railway, after several years of careful study of this problem, have decided that under their conditions the economies due to weight saved in their new cars amount to $219 per ton per year, or about 11 cents per pound. Their analysis of this subject was presented in the ELECTRIC RAILWAY JOURNAL for July 26, 1924. But in their analysis, they omit entirely the item of fixed charges on the investment in the cars themselves. Cars today cost approximately $800 per ton, including all equipment. Interest, depreciation, taxes and insurance usually amount to between 13 and 15 per cent, so that the annual fixed charges on a 20-ton car will be from $2,080 to $2,400, and for a 16-ton car between $1,664 and $1,920, a saving of between $416 and $480 per year, or more than $100 per ton. It appears, therefore, that a complete analysis would show on any road total savings of close to $300 per ton annually.

Single-Truck Cars Have Advantages

In the matter of wheel diameter and weight reduction there is almost a universal agreement, at least so far as urban operation is concerned. There is another trend, nearly as distinct, to which a number of able operators take vigorous exception. This trend is illustrated by the practical elimination of the single-truck safety car from recent purchases, even by properties for which it is in many respects better suited than the heavier and more expensive double-truck type. In the case of the larger cities, where headways on all lines are reasonably short, or where rush-hour loads are tremendously in excess of normal, the superior riding qualities and greater average capacity of the double-truck design probably offset the advantage of shorter headways. But in many of the smaller communities, any given investment in modern single-truck cars will pay a greater return than if the same amount of money were put into larger double-truck vehicles. This is based on the universal experience that where headways are 10 minutes or longer, any shortening produces a material increase in riding. In only a few cities, except those of the first class, did normal headways of less than 10 minutes prevail prior to the adoption of the safety car, and this condition still exists on many routes in too many communities. In others, notable among these being the Stone & Webster properties, enough safety cars were purchased to provide all-day headways short enough really to attract traffic. After that modern, light-weight double-truck cars, with their advantages in rush-hour service, were a logical purchase.

But for a railway in a city of 30,000 to 100,000 population, with normal headways of 15 to 20 minutes, which are still all too common, to purchase 10 double-truck cars at a cost of $125,000 in preference to 15 single-truck cars at $95,000, and to continue to operate on the old headways instead of cutting them to 10 or 15 minutes, appears to be an error in judgment because the operating cost would be lower and the service would be better with the small cars.

It must be admitted that the so-called standard 28-ft. safety car is not a comfortable vehicle in which

The Double-End, Center-Exit Cars of the Brooklyn City Railroad Are Unique

to ride and that it is in most instances extremely noisy. Nevertheless, railway after railway, on line after line, found that more people rode on three of these cars on a 7-minute headway than had been riding on two double-truck cars on a 10-minute headway. The objection that the car as originally built does not meet today's standard of comfort is a valid one, and is some justification for the use of the double-truck type. But a number of operators have taken the small car and made its comfort comparable to that of the ordinary double-truck design, by introducing heavily upholstered seats of greater width and spaced to give more knee room, and with a wider aisle, and by adding a rear exit door to minimize the crowding at the forward end.

Single-truck cars with such changes have been put into service in Lexington, Ky.; Knoxville, Tenn.; Columbia, N. C.; Zanesville, Ohio, and other cities. Their owners are enthusiastic about their performance, and in particular about the increased gross earnings that have followed their installation.

As to the suitability of the 30-passenger single-truck car for many routes in even the largest cities, C. E. Morgan, vice-president and general manager Brooklyn City Railroad, states emphatically that on the routes in Brooklyn over which his railway operates more than 180 Birney cars he would not substitute double-truck cars if they were available, unless riding should increase to such an extent that headways would have to be much shorter than at present. Furthermore, he believes that an attempt to operate larger cars on longer headways on these routes would be vigorously criticised by the patrons of the company.

Double Platform Versus Side Doors

The location of entrances and exits is a subject on which there is a decided difference of opinion. Opposing views are reflected in the more recent cars purchased. The majority of railways, including all in New England and nearly all in the South and on the Pacific Coast, appear to prefer the double platform car. Brooklyn, Detroit, Philadelphia, Pittsburgh, Cleveland, and Birmingham, on the other hand, have purchased side-door cars. In the case of Birmingham, it was purely a local cause, the need of providing separate entrance and exits for whites and negroes, that dictated the choice. A double door was located about one-third of the way from the rear of a single-end car, the negroes occupying the space to the rear and the whites the forward portion of the car. With the conductor stationed at this door, the arrangement permits positive segregation of the two races. Obviously, one-man operation of this car is not feasible. These cars were described in ELECTRIC RAILWAY JOURNAL for July 12, 1924.

In most of the other cities mentioned the intent was to speed up the loading of the passengers, particularly at heavy terminals, by utilizing the forward half of the car as a loading platform, entrance being at the forward end and fares being collected as the passengers pass the conductor, who is stationed adjacent to the center side door. These cars follow the general design of the Peter Witt type originally used in Cleveland.

In Cleveland, Detroit and Philadelphia the cars of this general design are single end, having but two doors, the one for loading at the front and the middle door for exit. Breaking into the side frame increases the weight approximately 1,500 lb. on the single-end car, in order to secure equivalent structural strength, and naturally the trucks, motors and accessories have to be heavier, so that the equipped cars average 3,000 lb. to 4,000 lb. heavier than a double platform car of the same dimensions. Single-end cars, moreover, do not readily lend themselves to turn-back service, and of course cannot be used on lines which do not have loops. Despite these obvious disadvantages, the managements in the cities mentioned believe the speed in picking up extremely heavy loads more than compensates for the higher operating cost.

To put center doors on both sides of a double-end car adds several thousand pounds more to its weight, but the Brooklyn management, having in mind the capacity loads picked up at the Manhattan terminals with cars on very short headways, decided in favor of such a design and pronounces them highly satisfactory for these conditions. It is admitted, however, that the weight is excessive compared to the recent cars of other properties, and studies are now being conducted to determine how the weight can be reduced safely. Changes planned seem to hold out interesting possibilities. In the rearrangement of cables and in platform or vestibule design, these changes are revolutionary, but they are not yet far enough advanced for discussion.

Another advantage possessed by center-exit cars is that with near-side stops front entrance involves less walking for the average passenger who waits near the curb line than if he must enter at the rear 40 to 50 ft. further from the street corner. In Brooklyn, this has been found to reduce the average time per stop materially.

In Philadelphia, the P. R. T. Co. has put in service a large number of single-end cars of this design. But the extra cost, weight and complications involved in a double-end center-exit car led the Philadelphia management to install end doors only on the cars it purchased for routes without loop terminals. There are many heavy loading points, particularly at rapid transit terminals, but some of the heaviest loads are from prepayment areas, and the collection problem is therefore not so acute as in Brooklyn.

The heaviest loading points on the surface lines of the Boston Elevated Railway are in the tunnels and rapid transit terminals, which are prepayment areas, and outside of these points there seldom is a load at any one stop that cannot be accommodated on the platform. Moreover, the construction of the rapid transit terminals necessitated the use of double-end cars. The solution, therefore, was the end entrance and exit double platform type, and an unusually light car was designed, its weight being approximately 31,000 lb. It is believed by the management in Boston that the unbroken aisle and floor of these new cars gives to the passengers a more pleasing effect of spaciousness than the two compartment effect of their older center-entrance cars, with a well and fare box breaking the floor line in the middle of the body.

There is no question but that the side-exit two-man car can pick up heavy terminal loads in a shorter time than can a prepayment platform car. In some places this advantage is worth paying for, but for average conditions, even in most of the larger cities. it is the writer's

belief that the lighter weight end-door design is more economical and efficient.

Some novelties in design have been introduced, notably the Minneapolis two-car permanently coupled train, with the truck frame inside the wheels, and using band brakes and an 8-motor controller. This is an extremly light-weight unit, and good reports have been received of its performance in service. But like the articulated three-car train in Detroit, another light-weight large capacity unit, the data available do not permit passing judgment as to its suitability under general conditions.

Nearly all recently built city cars are being arranged for one-man operation if desired, even those in the largest cities. Philadelphia and Boston are using extensively their latest and largest capacity cars with a single operator. When so operated, the side door or the rear door normally remains closed. However, in Boston, at rapid transit terminals, both front and rear doors are thrown open to facilitate the discharge of passengers, and both are again opened as the car stops at the loading platform. The same system prevails at some of the connection points between surface and elevated lines in Philadelphia. On cars going toward the elevated, fares are collected as the passenger boards the car; going from the elevated, the passengers pay as they leave, and en route only the forward door is opened while operating with one man. But at the heavy interchange point both doors are opened for quick unloading and reloading.

It is with strictly one-man cars that the greatest difference of opinion prevails as to entrance and arrangement. The standard single-truck Birney car uses a single front platform door for exit and entrance. Some operators have felt that a double door at the front was necessary, even at the expense of a longer overhang of the platform and poorer riding qualities. Modern double-truck one-man cars are nearly all equipped with the double door to permit simultaneous ingress and egress. On the Chicago Surface Lines H. H. Adams has worked out an arrangement by which the outgoing passenger opens and closes the exit door automatically. In these Chicago cars the exit door is on the front platform, but in Washington, D. C., the automatic treadle recently has been applied to the rear door, passengers leaving at that end if they so desire. The Dayton City Railway has for several years successfully operated double-truck one-man cars with a rear exit controlled by the motorman. More recently Lexington and Knoxville have bought single-truck de luxe one-man cars using rear exits. Similar cars are to be used in Zanesville.

In all these cases rear exits were provided to relieve the congestion that always exists at the front end on heavy trips where the exit is alongside the entrance. They seem to serve their purpose admirably. No accidents are reported and practically no attempts to board the car through the rear door.

Even in the rapid transit field there are evidences of a trend toward the reduction of weight so marked on surface lines. Boston has recently built for use in the East Boston tunnel trains of two, four and six cars that are revolutionary in this respect. The individual car dimensions and seating arrangement conform closely to those of the elevated cars, but by taking advantage of low wheels and modern design their weight is approximately 44,000 lb. per car as compared to 76,000 lb., a reduction of about 40 per cent. These cars were described in the Aug. 23, 1924, issue of the ELECTRIC RAILWAY JOURNAL. The Brooklyn-Manhattan Transit Corporation is experimenting with three-body articulated units for subway service, to secure a reduction in weight and simplification of apparatus and wiring, and apparently some gratifying results in both directions have been secured.

In the interurban field, two distinct trends have been apparent. The first and most pronounced has been in the direction of economy and the second toward greater comfort. Railways operating long, high-speed lines such as the Chicago, North Shore & Milwaukee Railroad, the Interstate Public Service Company and the Pacific Electric Railway have devoted most of their efforts to giving de luxe service, the last word in speed and comfort, almost without regard to first cost or operating expense.

But the vast majority of interuban companies purchasing new cars today have been confronted with so great a reduction in earning power that they have been compelled to seek reduced operating costs as the first consideration. On these roads more revolutionary changes have been made than can be shown even in the urban field. Cars weighing from 70,000 lb. to 80,000 lb. have been replaced by ones weighing from 26,000 to 34,000 lb., as was

The End-Entrance Car, Such as This One of the Boston Elevated Railway, Is Preferred by Many Operators

done by the Kentucky Traction & Terminal Company, the Western Ohio Railway, the Cleveland, Southwestern & Columbus Railway, and several others in the Central states. These new cars, operating on the same schedule speeds as the older type, show enormous reductions in energy consumption and in track and equipment maintenance. Their riding qualities at moderately high speeds, about 40 m.p.h., are superior to the cars they have displaced. Many of these roads report a material increase in passenger receipts since placing the new cars in service and all report a decided improvement in net earnings.

In all fields there has been a persistent and successful attempt to reduce both investment and operating charges by eliminating useless weight; to encourage riding by making the cars attractive in appearance and in seating arrangement, and facilitating ingress and egress of passengers. Splendid results have been obtained.

Almost all operators are agreed concerning the stimulating effect of short headways and fast schedules on the riding habit. Nearly all will agree that comfort is highly desirable as an inducement to riding. Double-truck cars, particularly those with the modern low-wheel truck designed for easy riding, ride well at either high or low speeds and attract favorable comment from passengers. The majority of modern cars use cross-seats in so far as practicable. Car riders certainly prefer them. But, with very few exceptions, these seats are the most uncomfortable things to sit on that the passenger encounters during the day. They are usually narrow and almost uniformly hard. The fact that the duration of the ride is comparatively short hardly reconciles the passenger to an uncomfortable seat. This phase of car design has not been given the attention it deserves.

Automobiles, even the cheaper varieties, have upholstery that gives real comfort to their users. On interurban cars the seat is wider, with spring cushions and soft back, and usually has an arm rest. But the short rider in city street cars has been denied this attractive feature. However, a few installations of upholstered seats have recently been made at Lexington, at Knoxville and at Columbia, S. C. At all three places, single-truck cars were preferred by the operators as being best suited to their traffic conditions, but heavily upholstered cushioned seats were used, of greater width and with more knee room than on the standard safety car. Headways were improved only slightly, but riding increased very materially, due mainly, the operators believe, to the comfort and luxurious appearance of the cars.

Another question to which little attention has been given by American designers is that of noise. A steel body with a bow roof makes an excellent drum, and noises coming up from the truck echo and reecho inside. Something can be done by means of headlinings, double floors and inside sheathing to reduce the sound vibrations. A number of railways have made good progress in this direction. The Twin City Rapid Transit Company has experimented extensively with means to damp wheel vibrations by wooden blocks on the web and by the use of band brakes. The English and the French have gone still further by reducing unsprung weight to a minimum, and have developed rail cars with automotive type drive, suspending the motors on the body instead of the axle. They claim that this not only reduces the noise but makes a better installation. This holds out some interesting possibilities. With a worm drive, for instance, gear noises would completely disappear; a greater gear reduction could be secured, permitting higher armature speeds and smaller and lighter motors, and the bodies could be brought still closer to the ground, again reducing step heights. There is no apparent reason why 22-in. or even 20-in. wheels could not be used. Such a development may seem at the moment a too radical departure from established practice, but after all, that is often the way of progress.

This Interurban Car of the Illinois Traction System Shows the Modern Trend Toward Light-Weight Construction for Operation at Moderate Speeds

Bus Operation

By CHARLES E. THOMPSON
Assistant to the President Chicago, North Shore & Milwaukee Railroad

A field of usefulness exists for the bus, although it will not supplant the electric railway. By co-ordinating its operation with existing facilities, transportation service can be improved. Immediate profits should not be expected. Bus rates must be higher than rail rates. Special trips are good advertising.

HISTORY has a habit of repeating itself. A quarter of a century ago the electric railway was the popular craze. Today it is the motor vehicle. To visualize properly the relative positions now occupied by the bus and the railway it is necessary to go back in one's mind to the early days of the industry.

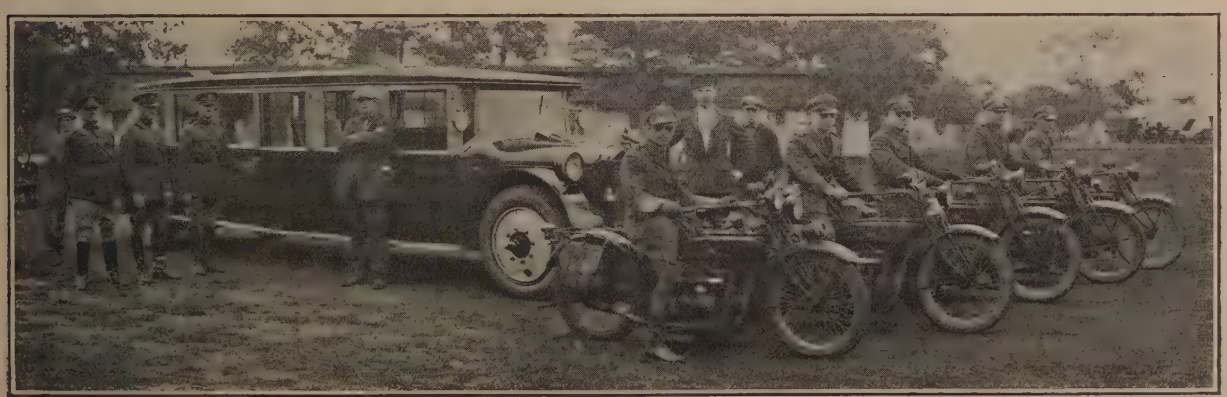
At that time there was a strong popular demand for urban, suburban and interurban electric transportation. Steam railroads looked with disfavor on the new mode of transport, much as some electric railway operators today look on the automobile and the motor coach. The talk then was of the "electric age" and enthusiasts predicted the end of the steam railroad. While the enthusiasm lasted many electric lines were projected into territory where sound business judgment might have foreseen that they would prove unprofitable. Some of these lines have been abandoned in the last few years, partly due to the advent and competition of the automobile, but largely due to the lack of foresight of their promoters.

Did the electric railway prove a serious competitor of the steam railroad after its novelty wore off? Was there any real cause for alarm on the part of the steam railroads? Experience has shown that there was not. The electric railway was able to operate more economically than the steam road and consequently to establish lower rates of fare. Undoubtedly, some short-haul business was taken from the steam roads, but it was business that was largely unprofitable. It was not the lower fare of the electric lines that established their popularity with the public so much as it was their ability to render a service that the steam roads were incapable of giving, and they prospered accordingly. They operated on shorter headways, they opened up territory inaccessible to the steam railroads, they stimulated the riding habit because of the greater convenience afforded and they eventually became valuable allies of the larger carriers.

With the advent of the motor vehicle a few years ago, railways fell somewhat into disrepute and many operators became greatly alarmed when they saw the automobile, the jitney and the motor truck cut into their revenues. But the popularity of the automobile and the motor coach was inevitable. The public always likes something new. The automobile was not only new, it was also convenient and it supplied a new kind of service. The public demands service and the use of the gasoline-driven vehicle has grown in favor.

The situation was somewhat disheartening to the electric railway operator. He saw earnings steadily falling off while operating expenses were mounting higher and higher. In many cases he attributed his troubles solely to the rubber craze and looked upon the motor vehicle as a menace which should be fought. He failed to recognize the motor vehicle as a factor in transportation which might be turned to the advantage of the electric railway.

In the early experience of the electric railway and the opposition of the steam railroads there is a lesson that can be applied to the present situation. The rubber craze of today



General Pershing en Route from Evanston to Rockford via Bus of the North Shore Line

Pay-as-You-Enter Type Bus Used in City Service

is much like the electric craze of twenty-five or thirty years ago. Ultimately the outcome will be the same Where there is a real need for electric railways they are in favor today. They have gone through the storm and the stress of war and post-war periods and are giving more service and carrying more passengers than at any other time in their history. Where there is no real need for them and where the service they performed can be rendered more economically by the bus they are being forced to the wall.

What is the lesson to be drawn? It is that the motor vehicle has its place in the transportation field and that its place must be recognized by the electric railway. Instead of being looked upon as an undesirable competitor, it must be regarded as a valuable ally and its use adapted to meet the peculiar needs of the communities to be served.

When the place of the motor vehicle is better understood it will be fitted into its proper niche in our scheme of transportation, always keeping uppermost in mind the thought of service to the public. Local transportation is a natural monopoly and should be treated as such. The operators of electric railways who have made transportation their life work are the men best qualified to operate bus service. If the goal to be attained is the greatest measure of service that can be given at the lowest possible cost, it follows that all local transportation agencies should be under a unified management, each agency performing the service for which it is best fitted.

If the experience of the last few years proves anything it proves that no other known transportation agency can take the place of the electric railway. Those who talk of the electric railway being obsolete do not know much about the transportation business. They are in the class with those who saw the electric railway supplant the steam railroad thirty years ago. In many of our large cities automobile congestion has grown to be the most serious of all civic problems and in the same cities the electric railways are carrying more passengers than ever before. It is absurd to talk of the bus supplanting the electric railway.

But it is equally absurd to say that the rubber craze will soon run its course. The automobile and the bus are here to stay. It is true that in many of our large cities automobile congestion has grown to such an extent that it has forced thousands back to the trolley as being much more economical of time and money, but that is not an argument against the bus. On the contrary, it is an argument in favor of unification and co-ordination of all transportation agencies.

In the smaller cities it may be that the bus can take the place of the electric railway. In such cases probably it will be found that the electric line has been subjected to unusual burdens in the way of taxes, street paving, etc., and that the traffic does not warrant the rebuilding of tracks and renewal of equipment to give the public the character of service it demands. In other cases it may be found that the bus can be used in conjunction with existing electric lines in serving outlying sections where the population is not sufficient to support the railway investment.

In the larger cities the bus can be used to provide crosstown service and as feeders to the electric lines in outlying sections. Usually the streetcar lines radiate from a central business district in such a way that a person wishing to travel from one outlying section to another outlying section must go by a circuitous route through the business district. Where good cross-town service is supplied the time required to make such a trip is materially reduced. In cases where such traffic will not support a rail line it may be sufficient to support a bus line. The bus can be used to advantage to augment rush hour service and because of its mobility it can be operated on boulevards where there are no railway lines. In large cities there are residential sections in which railway lines are not desired and the motor coach offers a convenient mode of transportation to the residents in such localities.

The bus has the greatest field of usefulness in cities of more than 250,000 population. Local transportation in these cities may consist of only street railways, or it may include surface, subway and elevated lines, but in all cases the bus can be used to advantage to supplement such service. It can be used on crosstown or feeder lines in outlying sections, as a temporary extension to an existing line until the territory is developed sufficiently to support a railway line or in boulevard service for those who live at some distance from existing facilities. It can be used to supply an express service for long-distance riders while the railway furnishes the local transportation. This would improve the service for the long-distance rider and make more seats available in the rush hours for the short-haul passenger.

It is evident, however, that in order to utilize the bus to the fullest possible extent its operation must be controlled by the electric railway. It must be made an adjunct to existing railways and all surface, subway and elevated lines be unified so that competition and needless duplication of service can be eliminated. Operating expenses can then be reduced and the public given the benefit of a properly co-ordinated service at a minimum cost.

The North Shore Line, for example, has not been troubled with jitney or bus competition. When the jitney appeared as a possible competitor to the street car in the city of Waukegan one-man safety cars were installed, headways reduced and service greatly improved. The jitney was unable to offer any serious competition and in a few weeks it died a natural death.

Six motor coach lines have been established during the past two years by this company in order that its territory might be adequately provided with transportation and new territory made tributary to the railroad. Of the six interurban bus lines now being operated, three are

strictly feeder lines serving territory not previously served. These lines operate from Kenosha, Wis., to Lake Geneva, Wis., 32.5 miles; from Waukegan, Ill., to Antioch, Ill., 20 miles, and from Waukegan, Ill., to McHenry, Ill., 25 miles. The others are parallel to the railroad and are in a measure at least in competition with the rail service, although in each case they are to some extent feeders to the railroad. These lines run from Kenosha, Wis., to Waukegan, Ill., 19 miles; from Waukegan, Ill., to Highland Park, Ill., 14 miles, and from Highland Park, Ill., to Wilmette, Ill., 14 miles.

In addition to the interurban lines the company operates urban bus service in the city of Waukegan, covering parts of the city not adequately served by street car lines. It is planned soon to operate other lines, both urban and interurban.

Our bus service to date has not been profitable from a strictly operating standpoint, but immediate financial returns should not be expected. It takes time to put any kind of business on a profitable basis. Those of our lines which have been in operation for about two years are now self-supporting. The others are showing good increases in traffic and will, no doubt, at least pay operating expenses within a reasonable time.

In the early days of electric railroading very little attention was paid to the cost of operation. It was assumed that railways could be operated more cheaply than steam roads, and therefore rates of fare were established on a basis much lower than those in effect on the steam railroads. Experience proved, however, that the assumption was not correct and the fares on electric interurban railways are now almost on a par with those charged by the steam roads. We should profit by the experience of the past. If we do we will know what it actually costs to operate a motor vehicle and what rates of fare will produce sufficient revenue to pay the cost of operation, provide for the replacement of the equipment at the end of its service life and provide a fair return upon the investment.

It is difficult to give operating statistics that will be of value without a lengthy discussion of details. However, it may be profitable to give a summary of operating costs based on actual experience and certain assumptions which may be modified to conform to conditions on other properties. For a bus in interurban service with seating capacity of 25 to 30, equipped with six 36-in. x 6-in. pneumatic tires, costing $8,000, and run 50,000 miles per annum by operators receiving 60 cents per hour, the cost will be approximately as shown in the table.

Touring Party on a Seven-Day Bus Trip Through the "Land o' Lakes"

Items:		Cost per Bus-Mile
Way and structures:		
Maintenance, garage and station buildings		$ .006
Equipment:		
Inspection, repairs, painting and miscellaneous garage expenses	$0.053	
Tire renewals	.019	
Depreciation	.032	
		.104
Power:		
Gasoline	.026	
Battery repairs and renewals	.003	
		.029
Conducting transportation:		
Superintendence	.005	
Wages of operators	.059	
Lubrication	.004	
Washing and cleaning	.006	
Heating, lighting and miscellaneous station and garage expenses	.018	
		.092
Traffic:		
Advertising and solicitation		.007
General and miscellaneous:		
Salaries of officers, clerks and general office expenses	.008	
Injuries and damages	.003	
Taxes and insurance	.038	
Other general	.002	
		.051
Total operating expenses		$0.289
Return on investment in equipment, garage buildings and tools and station buildings and equipment		.021
		$0.310

From these figures it is plain that under the conditions outlined a revenue of 31 cents per mile is necessary to pay operating expenses and a fair return upon the investment. What rate of fare will produce that revenue? That depends entirely upon the population and other local conditions surrounding the operation. Our experience indicates that bus rates should be higher than rail rates, particularly on those lines extending into territory where the population is not large. On such lines we are charging 4 cents per mile for cash fares, 3.6 cents per mile for one-way tickets, 3 cents per mile for 25-ride tickets and 2 cents for 50-ride individual monthly tickets. On the Kenosha-Waukegan line, which is competitive with our rail line, we charge the same rate and tickets are good either on the trains or the buses. This line is handling in excess of 400,000 passenyers per annum, and a large portion is new business, created by the service. On all our lines the minimum fare is 10 cents.

To my mind the most important reason for bus operation by electric railways is the matter of public relations. There are, no doubt, many cases in which it might be argued that the railway company would lose as much from its motor operation as it would from the competition of an independent operator. While this may be so, there is much to be gained by furnishing all the transportation needed in the community. Public good will is an intangible asset, but there is no other factor which so vitally affects the income account and the balance sheet of a public utility corporation. An electric railway can well afford to add something to its investment and even stand a substantial loss in bus operation if by so doing it can show the public a desire to serve.

In addition to the regular service operated on schedule over definite routes, we have found many other uses for the motor coach. We handle many special parties for lodges, Sunday schools, clubs, etc., whose members wish to have a picnic or attend a meeting at some point not served directly by rail lines. Real estate firms charter our motor coaches to show their salesmen the properties they have for sale and also arrange special service for prospective purchasers. We operate tours to points of interest in the Wisconsin "Land o' Lakes," some one-day tours, others of seven days or less, the rate including transportation, meals.

hotel accommodations and entertainment features. An accompanying illustration shows one such party on a seven-day tour. Trips for special parties have been made also to Washington, D. C.; New York, Boston and other Eastern points. The luxurious coaches which are used for these tours attract a great deal of attention and are an excellent medium for advertising our railroad.

Among our fleet of forty-odd cars are two "parlor car" buses, which are used for special occasions. Recently General Pershing desired to go from the home of General Dawes in Evanston to Camp Grant, near Rockford. The most direct route is via highway. A North Shore "parlor car" made the trip of 102 miles in three hours. After inspection of the camp General Pershing and his party were taken to Aurora, where they boarded their train for the West. Before his departure the general declared, "That was the finest trip I've ever taken in a motor car."

Like the many interurban railways which never should have been built and never had a chance of financial success, many motor bus routes have been, and will continue to be, established in territory where there is no possible chance of financial success. In some cases actual experience will have to determine whether or not a line can be made to pay. In others a survey in advance will indicate whether or not the line should be established. The first essential to successful bus operation is a paved highway; the second is sufficient population to support the service. One test that may be applied is to calculate the traffic from the population of the smaller terminus and of the intermediate territory, assuming that this population will provide fifteen rides per capita per annum. If that number will support the proposed service, the line will probably be successful.

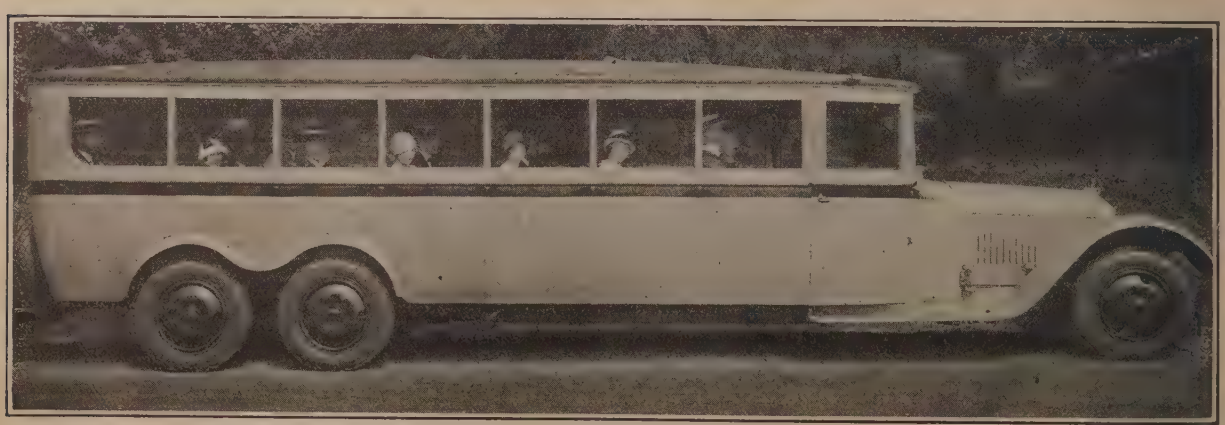
The industry can do much to modernize local transportation by using the motor coach to supplement rail service. We should not wait until forced by competition to enter the field of automobile transportation.

We should know the local transportation needs and supply those needs by the best possible methods whether that be by electric cars, motor coaches or airplane.

Three of the Newest Developments in Bus Design

This Model Vehicle Has a Wheelbase of 230½ In. and Provides Seats for 29 Passengers

In the Large Cities Double-Deck Buses Have a Wide Field of Usefulness



The Six-Wheel Coach Is One of the Recent Developments in Bus Transportation

Line Construction

By H. M. GOULD

Assistant General Manager Department of Street Railways, City of Detroit

Abnormal wear on trolley wire at suspension ears and failure of strain and line insulators and malleable fittings are among weaknesses of present suspension. Scientific study should be made to correct these defects. A.E.R.E.A. standard fittings should be used wherever possible. Much trouble with the overhead can be eliminated by using more ears in its erection.

WITH continually increasing competition from gasoline-propelled vehicles, together with high operating expenses, the street railway engineer must scrutinize his maintenance costs very carefully in order to maintain his equipment in the most efficient and economical condition. As the overhead equipment constitutes one of the major items of maintenance, it can well be investigated to determine its weaknesses and what should be done to remedy its defects.

Probably the greatest fault of the present-day overhead trolley construction is the abnormal wear of the trolley wire under the suspension ears. Every electric railway engineer is familiar with this effect and each one has some opinion as to the cause. However, while numerous disconnected experiments are being carried on by various railways in an attempt to alleviate this condition, up to the present time no scientific study has been made of this matter to determine accurately the action which causes this abnormal wear and what changes should be made in the overhead fittings to secure permanent relief from the trouble. The particular problem in this case is to determine the mechanics of the operation that takes place at the ear. The rotating wheel moves ahead and pushes upward against the trolley wire, which in turn is being forced down due to its weight. Thus the ear forms an obstruction to the forward motion of the trolley wheel. Numerous types of ears and hangers have been tried out, but none of them seems to have given universal satisfaction.

There are other weaknesses in the present overhead suspension. One is the use of wood strain insulators, which are unable to withstand the shocks caused by dewired trolley poles, with the result that the overhead is torn down. Another difficulty is that the usual malleable iron fittings will not stand shocks without breaking.

To overcome some of these weaknesses the Department of Street Railways has been experimenting with spring hangers, several types of ears, and the use of porcelain strain insulators. These devices make it possible so to install the overhead that even if an insulator should become broken the span or guy wires are interlocked in such a manner that it is impossible for the overhead to be torn down due to failure of the insulator.

The trend of present-day line material design is toward that which has better wearing qualities, is lighter in weight but with the required strength, and which will stand without failure the strains and shocks of railway service. Among the conspicuous examples of this trend is the use of drop forged steel fittings in place of malleable iron, the use of porcelain strain insulators to replace wood strains and the elimination of bronze frogs and crossings. The value of straight-line hangers is questionable. The dielectric strength of the insulation is not uniform, and its character is such that in many cases it softens sufficiently under ordinary summer air temperatures to release the stud bolts holding the ears.

There is no reason why a simple device such as a flat piece of steel cannot be used for holding up the trolley wire when a sufficient number of porcelain strain insulators are inserted in the span wires. The Department of Street Railways is at the present time trying out this scheme on a line which is equipped for test purposes with practically all the well known kinds of line fittings.

Drop-Forged Fittings Are Lighter and Stronger

Drop-forged line material fittings have been found much superior to malleable iron fittings in that they can be made very much lighter in weight and still have the same strength. They will not break under shock. When they are produced in reasonably large quantities they can be manufactured much cheaper than malleable fittings and in general they have a much better appearance.

At the present time there are too many different types of frogs, crossings and section insulators, so that every railway must carry a large stock of this class of material both in the storerooms and on the line trucks. In consequence the members of a line crew usually will find that on some particular job they do not have the proper piece of material with them. Then they must send the truck back to the storeroom, with resulting loss of time of the workmen and oftentimes a serious delay to service if it happens to be an emergency case. This procedure is similar to the old "plumber's trick."

The Department of Street Railways has assisted in the development of the Slaymaker universal frog, which, while rather crude at the present time, has been giving satisfactory service. When this device is fully developed it will tend to solve the problem of providing frogs for more than one angle in a single

fitting. This is also true of the Slaymaker universal crossing which is now being developed.

Although catenary overhead has a promising future for interurban service, it is unlikely that it will be used to any great extent in city construction. This is because it requires heavier supporting structures and side guys where poles are used. There also is a considerable amount of overhead wire. With the municipal authorities constantly ordering overhead wires placed underground, it is doubtful if the installation of catenary construction would be considered favorably by them.

Keep Overhead Inconspicuous

In this matter it behooves the railway engineer to use every means to keep the overhead as inconspicuous as possible in order to minimize complaints from the public. This is one of the reasons why the Department of Street Railways paints all poles, crossarms and galvanized material, such as crossarm braces, before installation, so as to make them as inconspicuous as possible.

At the present time the wood pole is commonly accepted as being the most economical supporting structure, but with the growing scarcity of suitable timber it soon will be replaced by concrete poles, which even now have many advantages. They are uniform in dimensions and can be made of pleasing appearance and in any desired color. When these poles are properly designed and manufactured they have all the advantages of strength of steel poles, and with the added factor that the maintenance should be negligible.

The use of building attachments in the congested districts reduces maintenance costs to a minimum, and improves appearance of the street.

There is no need for using larger than No. 00 trolley wire for city service since the trolley wire should be considered only as a part of the collecting device and not depended upon as a feeder to carry for considerable distances the large currents demanded in such service. The use of alloy wire in the heavy traffic districts has proved to be very economical. However, recent experiments made by the Department of Street Railways with copper trolley wire lead to the belief that this wire can be made so as to compare favorably as to wear with the alloy wires.

The standardization of material and equipment which has been the salvation of many other lines of business seems to have been disregarded by the electric railway industry. This is borne out by the general disregard of the American Electric Railway Engineering Association specifications by both manufacturers and railway men. The new A.E.R.E.A. Manual just out should help to correct this condition, but only if every one concerned has a copy and uses it at every possible opportunity. When specifications are drawn up by the various companies for railway material, references should be made to the corresponding specification in the manual. For example, this has been done by the Department of Street Railways in a new specification just issued for cedar ties. The paragraph covering this reads as follows: "Reference is made to the American Electric Railway Engineering Association specification No. W 113-23 as given in the Engineering Manual, issue of 1924, pages 863 and 864."

Use Greater Care in Erection

It has been found that a great deal of the trouble with overhead equipment can be eliminated by using more care in its erection. The use of a dynamometer in stringing trolley wire and span wire makes guesswork unnecessary and also eliminates the possibility of exceeding the elastic limit of the wire and thereby producing an excessive sag. This is not only unsightly but crystallization results, finally causing breaks at the points of suspension. There is no reason why a lineman should consider himself superior to a dynamometer in determining the proper stress in the trolley wire or better than a plumb line in obtaining the proper alignment of the wire.

By paying more attention to the proper guying and anchoring of trolley wire there is less danger of the wire being torn down. This trouble is not only costly but causes unwarranted delays. There is also less wear on the trolley wire with correct guying, because it is less likely to get out of alignment.

For city work the medium sized wheel with the graphite bushing gives the best efficiency. The use of a small wheel means a high rotating speed with the result that the wheel has a tendency to slide, rather than to turn. On the other hand using a big wheel means added weight on the trolley pole. This necessitates increased pole tension, and results in greater damage when trolleys are dewired. The use of graphite bushings provides suitable lubrication during the life of the trolley wheel and overcomes the defects caused by the neglect of periodic lubrication where wheels of the oiling type are used.

Relative Wear of Contact Devices a Problem

A detailed investigation should be made of the operation of trolley shoes both on high and on low-speed sections, and also on sections where wheels and shoes are both operated. This is desirable in order to determine the relative wear on the trolley wire with the different types of contact devices. Up to the present time too many opinions have been offered in this matter without enough actual tests to substantiate them. This was very forcibly brought to the attention of the Department of Street Railways during the arbitration proceedings with the Detroit United Lines in the matter of interurban rental, when the city attempted to fix an amount to cover damage caused by the Detroit United Lines operating interurban cars equipped with shoes over the city tracks. It was found that no reliable information was available on this matter. Consequently it was necessary for the Department of Street Railways to make tests consisting of micrometer readings on the trolley wire and also wipings made by means of a clean cloth which was applied to the trolley wire at various places. The amount of copper dust remaining on the cloth served as an indication of the relative wear caused by shoes, wheels and both shoes and wheels operating on the same section.

The entrance of the trackless trolley into the transportation field has not introduced any new known problems in the construction of overhead or equipment. However, there immediately arises the question of the cost of operation of the trackless trolley as compared with that of gasoline-propelled vehicles. Unfortunately, figures which are available are largely guesswork. They may be so interpreted as to appear favorable or unfavorable to the trackless trolley depending upon the whim of the individual who is analyzing them. The remedy for this is the adoption of a uniform system of accounts for bus operation by the company which contemplates the operation of a trackless trolley system.

Power Facilities

By CHARLES H. JONES
Electrical Engineer Chicago Rapid Transit Company

The power requirements of the electric railway now form a comparatively small part of the total demand in the average community. This favors the purchase of power from the central station, but the correct power contract is important to protect the railway. Outstanding developments in power distribution are the automatic substation and supervisory control.

WITH the extensive use of electricity for industrial work that has taken place during recent years, combined with economies by the railways generally in the use of power, the railway load in the average community is now only a small part of the total. This is quite a contrast with the early days of the electric railway, when the power required by it was a large proportion of the total used in the community. As few power companies were able to supply this demand the railways were forced to undertake generation for themselves. Today power companies have grown to such a size that they are able to handle any business offered to them. The accompanying diagram shows the total output of power companies in a large industrial area where they also supply all power for railway purposes. It indicates that the industrial power business is growing a great deal faster than the railway load.

Increased use of electricity in all lines of industry has greatly diversified the load, with improved load factors at the generating plants. This greater use of the equipment spreads the investment charges over a greater kilowatt-hour output and reduces the cost.

As a result of the rapid growth of the power business, numerous improvements have been made in generating, transforming and distributing equipment, making possible a reduction in the cost of energy despite increases in the cost of labor and materials. To take advantage of all the improvements being made in apparatus, it frequently is necessary for a generating company to purchase additional equipment of the latest and most efficient type. This can be utilized to the best advantage in base load plants, retiring the less efficient equipment to peak-load service only.

With the development of high-tension transmission it has become possible to tie together large power plants located adjacent to centers of population and industry, permitting a better use of plant capacity. Reliability is thereby increased and new business can be taken on that could not be carried economically at the lower transmission voltages. This has resulted in large efficient generating stations at points where the density of the local load would not justify their erection. All of these factors have kept the cost of power down to a minimum, making it desirable for every user in a community to patronize the company which specializes in production and distribution of energy rather than to make it a side line to his own business.

Railway Power Plant a Side Line

The cost of energy is the second largest item of operating expense on a railway system. Any saving that can be made will materially affect the welfare of the property. In order to see clearly why a railway cannot avail itself of central station economies in its own plant, it is necessary to analyze the power requirements. The railway load factor depends on the class of business handled, being about 35 per cent on a property having a heavy rush-hour service, and running as high as 55 per cent where there is little service above the average at any time of day. On interurban lines where freight is handled at night there is a possibility of raising the load factor somewhat above 55 per cent. Since this is the only railway load there is no way of improving the plant load factor for a railway generating station and thereby reducing the cost of energy. The annual increment of increase in load depends on the increase in service on the line. As a general thing, these increments will amount to only about 5 per cent. Increase in the amount of equipment in the plant will be slow, making it impossible to take advantage of more efficient machines as soon as they are put on the market by the manufacturer.

Due to the rapidity of improvement in equipment, obsolesence rather than wear has been the determining factor in discarding apparatus, thus requiring a high rate of depreciation to provide for replacement. In general this has been lost sight of by railway companies, and replacement funds are not available to provide the more efficient equipment.

The size of units in a plant must be kept down to the point where a minimum of spare capacity will be tied up to provide a reserve against the breakdown of a unit in the station. As higher efficiency is obtained in the large units, it is impracticable for the average railway to use the most efficient machines.

The operation of a power house is a side line to the railway business and generally the management is loath to make the necessary appropriations for scientific operation of the plant. The total payroll rather than the cost per kilowatt-hour is looked upon as the measure of energy cost and, since the plant is com-

paratively small, it is not feasible to hire the specialized talent required for the best operation. Frequently one man must do all the general supervision and engineering, and in these times no one individual can hope to master all the details of best operation of a power system.

Wherever a power plant is operated by the railway, it is a source of considerable worry to the executive. Its operation is foreign to his regular line of business. In times of stress, when all of his energy should be given to transportation problems, his mind will be troubled by power worries. New capital is continually required for the productive end of the transportation business, and usually more is needed than can be obtained. If there is a shortage of available money the power house expenditures usually are deferred until the time comes when they must be made in order to continue operation. This practice results in a further reduction in the efficiency of the plant. When the financing of these requirements can be passed on to a company whose prime business is furnishing power, just so much more capital is rendered available for the primary end of the railway business.

The Effect of New Developments

Within the past few years considerable improvement has been made in rotary converters, with resulting reduction in size and increased commutating capacity. Developments in design have brought the 60-cycle rotary converter to the point where general use can be made of it for railway work. This has been a big step toward encouraging the railways to buy power, as the large developments in the general power field have been made at a frequency of 60 cycles. Hence, in order for the railway to enjoy the reduction in cost, the 60-cycle frequency has had to be adopted, unless the power company was maintaining a 25-cycle system.

From the foregoing, it is apparent that in considering a new undertaking there is no good reason why a railway should go into the power generating business. Even where a company is operating a modern power house the substitution of purchased power is well worth investigating, as under such conditions a favorable contract with the power company is possible on the basis that economy of operation can be improved in conjunction with the general power business, when the plant is handled by specialized talent.

Appreciation of Problem Leads to Satisfactory Contract

Power companies and railways are both public utilities, and as such must give service as demanded. In this respect the two are on common ground, and therefore, the railway is in a position entirely different from that of the average industrial customer of the power company, and must be considered from a different point of view when a contract is framed. In negotiating a power contract a number of things must be taken into consideration by both parties if the best results are to be obtained. The power company should study the railway company's problem and understand its requirements in rendering service to the traveling public, especially under adverse and unlooked for conditions. The railway should realize that the power company is not an unfailing source of supply or an unlimited reservoir of power.

While the railway load may be very sizable, the rate must be such that the power company will make a reasonable profit on the business. The period to be covered by the contract should be made as long as possible. If provisions are made for a variation in price of coal and labor, for readjustment of basic rates when conditions warrant, and for a lower rate to the railway when any other consumer in the same class is given a rate reduction, terms of less than 10 years should not be considered. The contract also should provide for automatic lengthening of the period in case additional power demands are made during the latter years of the term.

The method of determining maximum demand is important, as it will affect vitally the cost of energy to the railway company. An incentive should be offered to maintain it as low as possible, so that this will keep down to a minimum the power company's investment for the service. The general method has been to use the average of several one-hour peaks on consecutive days, but there seems to be a tendency to change to the average of several one-hour peaks on scattered days. This latter practice is unfair to the railway. Conditions beyond the railway's control occasionally cause excessive individual hour loads. When the power company has the capacity available the railway should not be penalized by being prevented from readjusting its service on the following day to compensate for the abnormally high hour. Occasionally there is a desire on the part of the power company to base the maximum demand on periods of less than one hour. This puts a heavy burden on the railway and discourages the buying of power as the momentary peaks are largely governed by conditions of street traffic and congestion.

Synchronous converters inherently have good power factor when the supply voltage is reasonably well regulated and when they are properly operated. This condition is favorable to the power company and it should be considered in the negotiations. Since high-tension lines are rarely provided with automatic regulation, and it is an unwarranted expense, the contract should not carry any penalty for failure to maintain a specific power factor unless at the same time it compensates the railway for giving a better power factor than that guaranteed in the contract.

Providing for Increases in Load

Provision should be made in the contract so that the increments of load increase to carry additional service will be provided for by the power company. This should be done without requiring the railway to make written requests for such increases, if these are made on available sources of supply. These increases will probably never amount to more than 10 per cent, although 20 per cent increases should be handled without previous official notice. When new points of supply are required, written application should be made a sufficient time in advance of the actual need to give the power company opportunity to make the necessary additions to its system to care for the changes.

Demands once established by written application should stand during the life of the contract. Provision should be made so that the demands established by the natural increments of load increases could be dropped after carrying them for one year, the amount of decrease not to be greater than 10 per cent of the previous year's demand. The railway will run into unlooked-for loads due to things beyond its control.

such as extremely cold weather for a few days in the winter. Some provision should be made for supplying these abnormal peak demands by utilizing some of the reserve capacity which the power company must of necessity have on its system. If this capacity is available, power should be furnished without any obligation on the part of the power company to supply this additional demand. The railway should pay for these peaks on some emergency basis, and should not be penalized on its demand for a year or more. Such an arrangement will be mutually beneficial to the power and railway companies and will encourage the railway to give additional load to the power company. The substitution of electric heat for coal heating, while desirable, is sometimes almost prohibitive on account of peak loads produced by it on a few cold days in the winter.

The railway load probably will be large compared with those of most of the power company's customers. The basic rates for demand and energy will have to be the same as those given to large industrial customers. Provision, however, should be made for reducing these as the demand and energy use go up, particularly as the railway load will be diversified from the general industrial load. Furthermore, the railway business is very stable and is not subject to the general industrial fluctuations. While its revenue may fall off in times of depression, its car mileage cannot be cut in proportion to the reduction in riding when business conditions are poor.

Conversion—by Railway or by Power Company

The railway system requires electrical energy in a form not used in general industrial work. For this reason the basic costs will have to be referred to that of alternating current. Whether the power company or the railway does the converting to direct current is an open question that may be handled either way, and there is much to be said on both sides of the question. If this service is to be performed by the power company it should be covered by an agreement supplemental to the general power contract. Conversion for city lines and for interurbans presents different problems, and each will be discussed.

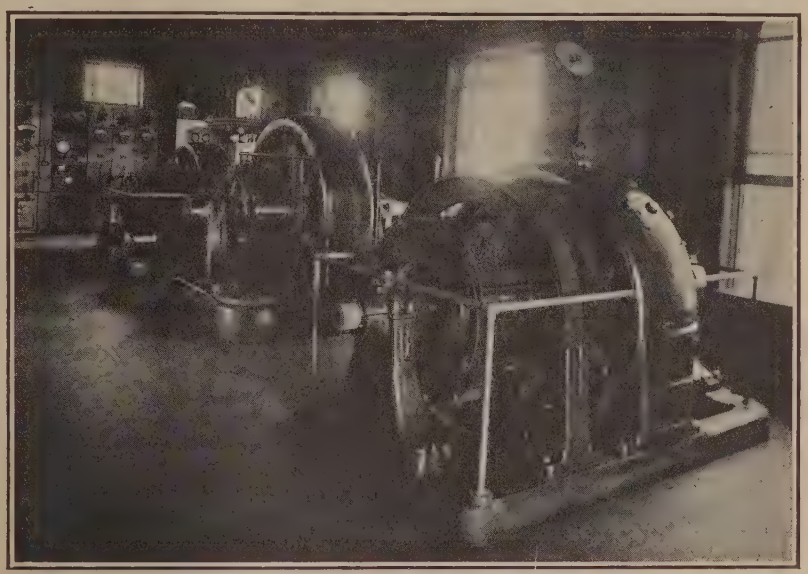
In a city the power company must maintain high-tension distribution lines for its own substations. Hence the high-tension cable system for railway substations should belong to the power company. It would be an economic mistake to build a duplicate system, thereby losing the advantage of the diversity which results from interconnection. The maintenance of a high-tension cable system is a highly specialized job, and the power company, with its technical organization, is in a better position to do the work than is a transportation company.

On interurban systems the transmission line connecting substations will probably be on the railway right-of-way. This line is likely to be isolated from the main power transmission system and of little use to the power company. In this case it will be better to have the railway own its transmission line, with provisions for joint use should it become desirable.

Substation ownership is an open question in city work, even more so than before the days of automatic stations, for then some saving in operation could be effected by combining the railway and lighting stations. With the use of automatic equipment on both railway and light systems there is little choice today. With power company ownership the railway is relieved of financing the station, and there may be some saving in operation due to absorbing the cost of the general supervision by the power company's organization at little or no additional expense. On the other hand, the railway will have to pay the power company some profit for the service. The power company will generally insist upon a more elaborate building than the railway actually needs as the former uses its substations to some extent for advertising purposes.

The substation question is closely related to that of distribution, especially with the advent of automatic equipment. This makes it difficult to incorporate in a contract a provision for the installation of additional substations without opportunity for considerable controversy and difference of opinion as to the necessity for them. The railway which wants them does not have to finance them, if they are to be owned by the power company. In view of the above I believe that it is more satisfactory to have the railway company own the substations for railway use exclusively. In case something is to be gained by joint substations the railway should provide the equipment and the power company the building. The power company should operate the station with a division of expense between the two companies.

On interurban systems the substations will serve only the railway and can be operated and maintained



Development of Rotary Converters in the Past Twenty Years Is Indicated by the Three Machines in This Station

This shows the tendency toward smaller, more compact units. In the background is a 500-kw. unit 10 years old, while in the foreground is a modern 1,000-kw. unit. The machine in the center is a 300-kw. machine 20 years old.

more advantageously by it than by the power company, for in this case they are closely related to the distribution system. Therefore, they should be owned by the railway.

The distribution system, which comprises the contact conductor and such parallel feeders as are required to carry the load, usually is attached to the poles supporting the overhead system. This is the portion of the power system on which the most alterations and additions are made to carry the load and suit modifications of service. During times of storm it is most liable to get in trouble. This part of the power system should always be owned and operated by the railway. At the present time it does not seem possible to turn this over to the power company with the hope of any reduction in cost.

Automatic Substation Modernizes Conversion

The outstanding improvement in the railway power field for years has been the development of the automatic substation. This has done much toward making it possible to raise the over-all efficiency of the power distribution system without prohibitive cost.

Prior to the development of the automatic substation, the practice was to install as great a capacity as possible in one substation to reduce the operating expense, even though it required considerable feeder copper. The economic balance between fixed charges and feeder losses governed the size of feeders installed, but in special cases it was necessary to discard this balance in order to obtain a suitable operating voltage. With the development of the automatic station the heavy operating charge was eliminated. This makes it possible to consider the installation of more substations, reducing the feeder copper and also the losses. Thus a new economic balance in the distribution system is created. This calls for an entirely new engineering analysis of the whole subject of distribution. The more efficient distribution of power made possible should not be overlooked.

On an interurban system the economies to be gained from automatic substations is apparent. The load density per mile of track is low, due to the class of service rendered. The factor determining the size of the distribution system is voltage drop rather than load. Stations are of small capacity with a correspondingly heavy operating charge per kilowatt-hour output. As a means of keeping the operating cost as low as possible the tendency always has been to minimize the number of substations. Frequently this has resulted in operating with a lower line voltage than was desirable. The automatic control equipment reduces operating expenses considerably, and by relocating some of the existing converter equipment along the line, considerable saving can be made in line losses. At the same time the average line voltage is improved. On heavy interurban systems the application of automatic stations has made operation on a 600-volt basis economical long after it would have been necessary to go to a higher voltage with manually operated stations.

On city systems the layout for automatic stations calls for considerable engineering study. There are many factors involved which vary with the localities, so that a general statement cannot be made. For a property already in operation, it will be more difficult to justify their use, in view of the retirement of property and rearrangement of the distribution system necessary if maximum economies are to be realized. Factors not directly involved in the economic distribution problem, but which are of considerable importance and require consideration, are the simplification of the electrolysis problem and reduction of the human element in substation operation. Where extensions are being made, or where complete rejuvenation of the distribution system is contemplated, the problem is simplified. A more efficient distribution system can be laid out with automatics and at a cost materially lower than is possible with a manual system, providing all possible savings are made in the installation and no greater degree of reliability is demanded of the automatic system than that given by the manual system.

Factors that Should Be Considered

As a number of solutions can be arrived at in any specific case, many trials must be made and analyzed before the best decision can be given. A number of variable quantities must be considered and a relative weighted importance placed on them for analysis. Many distribution engineers have been considering this problem for some time and developing new thoughts. Considerable of this work has been crystallized in reports of committees of the American Electric Railway Engineering Association. These should be studied by any one contemplating the installation of automatic stations. They represent the diversified views of engineers who have studied the subject on their own properties and have arrived at as near a general solution as is possible at this time.

Supervisory Control a Forward Step

The use of automatic substations has produced a new problem—that of exercising some degree of supervisory control over them. Pioneer work along these lines is still in progress. This consists of placing in the hands of a dispatcher, facilities for opening and closing feeder and other switches in the stations and a means of keeping him informed at all times of the operating conditions. The need may be real or imaginary, but it appears that with extensive investment in automatic equipment some additional investment is warranted to give a continuous check on its performance. Where a supervisory control system is installed the operator feels safer in increasing the time between inspections than without it. The operating saving thus made will carry at least a portion of the investment in supervisory control. Extensive city installations of automatic equipment have been made both with and without supervisory control, and in a few years it may be possible to draw definite conclusions as to the extent to which supervisory control is justified, if at all.

The present systems of supervisory control with answer-back features require three wires between the station and the control point, but a number of stations can be tapped onto the control wires. Where it is possible to lease these wires from the telephone company, as in a city, the problem of their maintenance is simple and the reliability is good.

On an interurban system it is generally necessary to attach the control wires to the overhead supporting

structures along the right-of-way. Here the questions of maintenance and reliability are serious, for during storms, when the control is most needed, considerable line trouble is likely, especially with small wires. There is room for considerable improvement in the way of developing a supervisory control system that will operate over a smaller number of wires.

Revised Sectionalizing with Automatic Substations

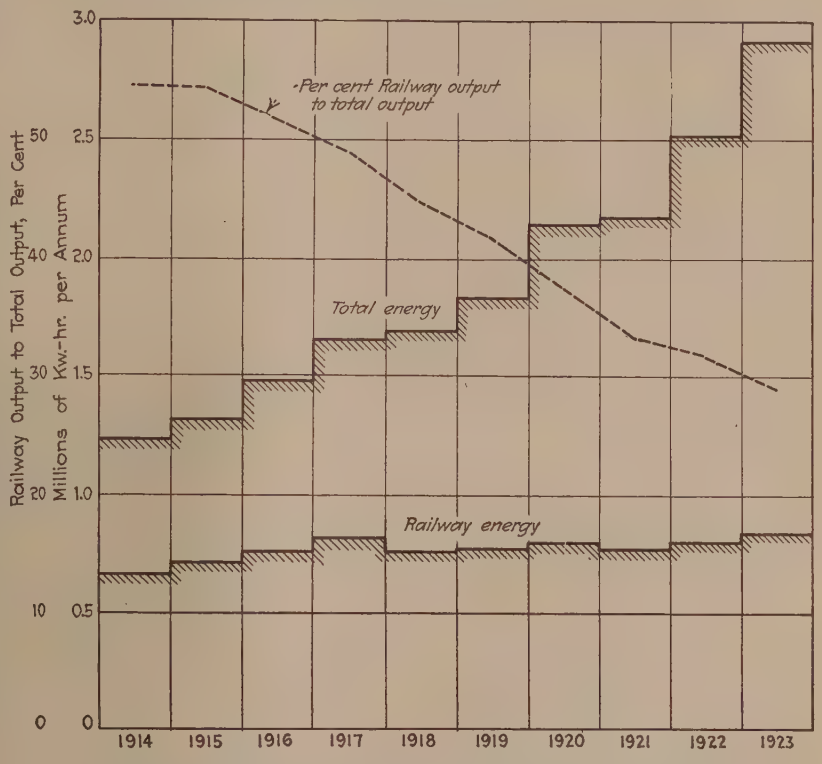
With automatic substations on city distribution systems it has been necessary to readjust the sectionalization due to the greater number of stations and the corresponding reduction in their size. It has been necessary to put more tie sections between stations so that with a station down during the non-rush hours on account of light load, or during the rush hour due to trouble, the load in that section can be carried by the adjacent stations. With large manual stations, feeders were laid out for supply from one point only at all times, resulting in a limited number of tie sections to adjacent stations. Under these circumstances traffic conditions and ability to operate certain routes in preference to others had considerable to do with sectionalization. The load on each individual feeder had little to do with determining its length as the station had sufficient capacity to handle the load. A limited number of automatic sectionalizing switches connected the extreme ends of feeder systems together to take advantage of diversity of load and to make the best use of the distribution copper used.

From a purely economic viewpoint it would be desirable to tie all the feeder system into a solid network and simply to tap into this at each substation. This is not practicable as there are too many chances of grounds which would cause considerable damage in times of trouble. With an exposed contact system which for various reasons must be killed from time to time, sectionalization must be provided in the substations. Such a system can be approached more nearly where there are several small substations than where there are a few large substations. The development of automatic sectionalizing contacts which can be placed at various points throughout the distribution system has been of considerable use to railway companies. If used judiciously these can make a considerable saving in distribution system losses.

Modernization and the Engineer

Modernization in its broadest sense simply means perfection in operating details, elimination of waste in every form and applying to the system every modern improvement which is made, not only for railway work, but for every form of industry.

There are a great many improvements both in labor-saving devices and in methods which were brought out due to keen competition in the industrial world which forced concerns to take advantage of every short cut in order to exist. This incentive to strive for improvements is not so apparant in the railway field as it is in the industrial world, but it is coming to the front. There is a limit to which the fare can be raised. With costs of materials and labor continuing to rise the profits in the railway business must be made through improved methods which lower the cost of operation. This opens up a vast field for the electrical engineer, who has practical knowledge of the details of the work to analyze his problem and apply to his system improved methods. It will require considerable educational work to develop men who can handle this phase of the business. This can be done by starting them on layout work for all new equipment that is to be put in, so they will know the details of the installation. This will cause them to look for new methods and to analyze the present methods with a view toward developing new ways of carrying out the project.



Curve Showing Relative Growth of Power and Railway Business in an Industrial Center. Improvements in Railway Operation Have Kept Railway Load Down, While Industrial Power Use Has Increased

The distribution end of the railway system has practically stood still for many years, and methods of doing work have not kept up to the pace set by the industrial world. It is going to require considerable study on every system in order to accomplish something in this field. The size of the engineering force will have to be increased. Although it may be difficult to point to definite savings made, especially if comparative data on the cost of doing a certain job for years past are not available, the cost of the additional engineering help can be justified.

Electric Railway Financing

By H. M. ADDINSELL
Harris, Forbes & Company, New York

The position of the electric railways has improved greatly in the past three years, but the public has not yet fully reacted to the change. The issues of the present year show a marked advance in the ability of electric railways to obtain capital. Customer-ownership plans have had beneficial results in improving public relations, but should be undertaken with care.

AT THE Electric Railway Association convention in the fall of 1921 I had the opportunity of discussing the general question of the market for street railway securities. The immediate conditions in the industry made the question particularly interesting at that time. The turning point had definitely come after the long continued difficulties of the war period. The intolerable pressure of constantly rising operating costs against revenues limited by a fixed 5-cent fare had been doubly relieved. In most of the important cities outside of Greater New York the 5-cent fare was already a thing of the past. Costs of materials, and to a lesser degree of labor, had furthermore shown substantial decreases from the peak of 1920.

While irresponsible jitney competition was still a serious problem in many localities, it was becoming more and more apparent that a choice of one of the two forms of service would have to be made and that the jitneys were far from being capable of handling the entire local transportation in congested centers. A few large communities had had the opportunity of proving by experience what the jitney could do unaided. In each case a comparatively brief period of suspended service was sufficient to furnish convincing evidence of the essential nature of electric railway transportation and to effect a decided change for the better in the attitude of the public toward the railway company. By 1921 well informed opinion had come into almost unanimous agreement with the finding of the Federal Electric Railways Commission that the street railway was "the most nearly adequate, reliable and satisfactory system available for transporting the maximum number of people through the streets of our cities with the least interference with the use of those streets for other purposes of public ways."

Substantial Improvement Since 1921

Statistics, articles and editorials published in these pages have evidenced the further substantial improvement of the electric railway industry since the fall of 1921. Under the sound influence of common sense and common justice, the idea of the fixed 5-cent fare continues to give way before the more equitable idea of payment for the services of the street cars in line with present-day costs and conditions. The benefits which have accrued to the companies in the form of lower material and labor costs have been supplemented by active work on the part of managements in developing more efficient types of equipment and more economical methods of operation, all of which have found a gratifying reflection in the form of increased net earnings.

The extent of the menace of gasoline competition is now more clearly defined and by that very fact seems less generally serious. Several years of experience have made it possible to estimate more accurately the real value of the bus as a feeder and in supplementary service and have emphasized its inability, at least in its present form, to compete successfully with the electric car on rails as a medium for handling mass transportation. The traffic problems created by the excessive use of the private automobile in congested centers are rapidly becoming so intolerable as to preclude a much further increase in this type of urban transportation.

In 1921 the opinion of the investing public, as evidenced by the market levels for electric railway securities, was far from having recovered from the memory of the earlier and less favorable conditions and any discussion of new street railway financing was at that time necessarily confined to a purely theoretical basis. The further improvement in the prosperity of the electric railway industry since 1921 has had its effect on the security market. As is indicated by the chart shown herewith, the prices for street railway bonds since the low point of 1920 have improved more rapidly than can be accounted for entirely by the changed conditions in the money market. Furthermore, it is no longer necessary to confine the discussion of street railway financing to an entirely theoretical basis. Several substantial issues of bonds have been floated during the past two or three years in behalf of companies doing an exclusively street railway business.

Nevertheless, the change in the rather hostile attitude of the investing public toward electric railway securities since 1921 has been one of degree rather than of kind. Referring again to the chart, it will be seen that on the bonds of the power and light, telephone and gas utilities, the investing public is demanding a yield not much higher than pre-war levels. On street railway bonds they are, however, demanding a yield substantially above what was acceptable in 1914. Before the war it was not uncommon to find an investor who refused to buy anything except electric railway se-

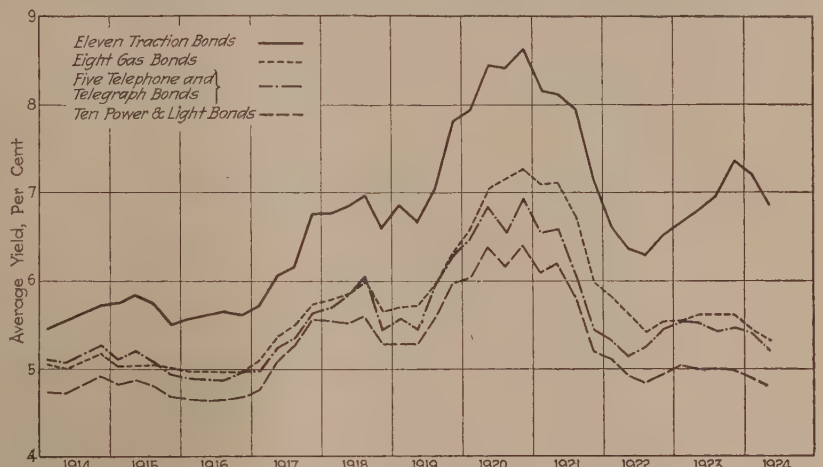
curities. Although the war has been over six years now, still it is not uncommon for a bond salesman to have difficulty in persuading a customer to purchase the bonds of a company just because it happens to do a street railway business in addition to its gas and electric business, no matter how sound and profitable the railway department may be.

The new bond issues by street railway companies referred to above have formed a very small proportion of the total issues of utility securities. In the weekly lists of new financing published by the New York *Times*, for example, only 19 such issues are listed between Jan. 1, 1922, and Sept. 1, 1924. These issues total less than $71,000,000 as compared with an aggregate of public utility bond financing in the same lists somewhat in excess of two billion dollars. Additional money for street railway purposes was, of course, raised by companies doing a mixed utility business, but in practically all cases this was accomplished by placing special emphasis on the non-railway features of the security offered.

Prejudice Against Railway Securities Lessening

I should dislike to create the impression that I am over-pessimistic regarding the future of the street railways in this country, but any discussion of electric railway financing today must take cognizance of the fact that there is and has been for some years a strong prejudice in the minds of investors against street railway securities. I think I am safe in saying that this condition is showing some improvement. This conclusion is borne out by an analysis of the 19 street railway issues mentioned above. Most of the issues in 1922, and all of the issues in 1923, represented purely temporary financing. Half of the issues for those years (representing over 30 per cent of the total bonds) were in the form of equipment trust certificates, which have come to be regarded as affording about as comprehensive protection to the security holder as any instrument yet devised. So far this year, however, all but one of the issues have taken the form of long term bonds which will constitute a part of the permanent capital structure of the borrowing companies. Furthermore, the total principal amount of the issues offered during the eight months to Sept. 1, 1924, exceeded the aggregate principal amount for the two preceding years.

The handicap which the electric railways suffer in competing for funds in the general market, however, continues apparent. Most of the borrowers were companies which operate in the larger centers and which were able to present exceptionally good records of recent performance. Many of them had recourse to the expedient of a sinking fund or other special bit of "scenery" to give their issues added attraction and all had to pay rates of interest



Average Yield to the Investor of 34 Representative Electric Railway, Light and Power, Telephone and Telegraph and Gas Bonds, 1914-1924

substantially higher than would have been necessary on issues by comparable companies in other lines of industry.

Work of the Investment Banker

All this has an important bearing on the discussion as to what an investment banker can do in the way of raising funds for an electric railway company. No matter how safe an issue may be intrinsically, no investment banker can afford to handle it unless it also will be salable. One of the first conclusions that must be drawn from the history of recent street railway financing is that only the obligations of the companies operating in the larger cities are, under present-day conditions, generally salable in the open market. While there will, of course, be exceptions to any rule, it is probably safe to say that companies serving communities of less than 100,000 to 150,000 population will have to develop local channels of finance.

Political considerations have been the direct or contributory cause of the past difficulties of so many street railway companies that an acceptable franchise and good public relations will be important considerations in the discussion of new street railway financing. In particular, the fixed 5-cent fare contract has been such a notorious stumbling block that some specific recognition of the right of the company to rates sufficient to enable it to earn a fair return on the capital invested and provision for machinery to adjust the fares to produce such a return are extremely desirable if not essential features in the franchise. Such "service-at-cost" agreements have fully demonstrated their worth over considerable periods of years in both Cleveland and Montreal and are now becoming quite general.

Another point which investors and investment bankers will today look for in a franchise is some provision assuring the company protection against irresponsible competition in any form. A franchise granting the company exclusive right to do the local *transportation* business rather than the street railway business alone is of course the ideal answer to this question. This is really the most logical arrangement, for the company would then be in a position to give a co-ordinated service using electric cars on rails, electric buses, automobiles or any other vehicles that would be the best suited for the particular problem at hand.

While a well-drawn franchise is an excellent protection against

NEW BOND FINANCING BY COMPANIES IN THE UNITED STATES DOING AN EXCLUSIVE STREET RAILWAY BUSINESS, JAN. 1, 1922, THROUGH AUG. 31, 1924.
(From the New York *Times'* Weekly Lists of New Financing.)

Year	Short-Term Securities	Long-Term Secured Bonds	Equipment Trust Certificates	Total
1922	$ 4,600,000	$ 9,000,000	$ 2,875,000	$16,475,000
1923	8,700,000	.....	6,577,000	15,277,000
1924 through 8/31	9,000,000	29,750,000	.....	38,750,000
Grand total	$22,300,000	$38,750,000	$ 9,452,000	$70,502,000

political attacks, the best defense of all is public good will. So much has been written about the various steps a company may take to achieve this end that it is unnecessary to go into detail here in this connection. The importance of attractive service, direct advertising, the cultivation of a spirit of courtesy and diplomacy on the part of employees were, for instance, emphasized in almost all the papers presented by various electric railways for the Charles A. Coffin medal competition last year.

Customer Ownership to Gain Good Will

Customer-ownership compaigns constitute another important means by which a company can gain the good will and sympathetic attention of its public. This means is particularly interesting to the investment banker because of its secondary significance as a method of raising the equity money which will go toward increasing the security behind a bond issue. The transportation company in a thriving community will have to expand its facilities from time to time to keep up with the growth in population. Such expansion requires new capital, a certain portion of which may come from the sale of new bonds. The prudent investment banker before handling those bonds will want to be sure that the company is in a position to raise the balance of the cost of the project. Customer-ownership campaigns constitute an important field for the distribution of the junior securities, through the sale of which such equity money is preferably raised. A note of warning should be sounded, however, in this connection. Care should be taken that these securities represent real values and should be protected by ample earnings. The sales price, moreover, should be in line with the general market for such securities. Otherwise, a reaction will inevitably set in which will be disastrous to the future development of this important and desirable means of supplementary financing.

Of course the fundamental requirement of a sound capitalization structure for a street railway or any other company is a conservative ratio of bonded debt to total property value. Here again it is impossible to lay down any definite rule, as the percentage of bonds will vary with individual conditions. A study was recently made in my office of the ratio between the bonded debt and the valuation for rate purposes established for the properties of various power and light utilities.

AVERAGE YIELDS ON 34 PUBLIC UTILITY BONDS, 1914-1924.

Year and Month	Eleven Traction Bonds	Ten Power and Light Bonds	Five Telephone and Telegraph Bonds	Eight Gas Bonds
1914				
March	5.45	4.74	5.11	5.06
June	5.54	4.72	5.08	5.00
September	....	....	....	....
December	5.72	4.92	5.27	5.18
1915				
March	5.75	4.82	5.10	5.03
June	5.83	4.87	5.20	5.03
September	5.75	4.81	5.08	5.04
December	5.52	4.68	4.94	5.00
1916				
March	5.55	4.65	4.89	4.97
June	5.60	4.64	4.88	4.96
September	5.64	4.65	4.86	4.96
December	5.60	4.67	4.94	4.95
1917				
March	5.70	4.75	4.96	5.09
June	6.05	5.08	5.23	5.37
September	6.14	5.25	5.34	5.50
December	6.75	5.56	5.62	5.73
1918				
March	6.74	5.54	5.68	5.77
June	6.83	5.51	5.81	5.84
September	6.95	5.59	6.04	5.98
December	6.58	5.28	5.43	5.65
1919				
March	6.84	5.27	5.56	5.67
June	6.65	5.26	5.44	5.70
September	7.04	5.57	5.95	5.93
December	7.80	5.76	6.28	6.31
1920				
March	7.91	6.03	6.46	6.57
June	8.44	6.37	6.83	7.03
September	8.40	6.14	6.53	7.13
December	8.62	6.38	6.91	7.25
1921				
March	8.13	6.07	6.53	7.07
June	8.09	6.17	6.57	7.09
September	7.92	5.78	6.03	6.71
December	7.14	5.17	5.43	5.97
1922				
March	6.59	5.09	5.31	5.81
June	6.34	4.91	5.12	5.61
September	6.28	4.82	5.22	5.39
December	6.50	4.92	5.43	5.51
1923				
March	6.64	5.02	5.51	5.53
June	6.77	4.96	5.50	5.59
September	6.94	4.98	5.40	5.59
December	7.34	4.96	5.43	5.58
1924				
March	7.18	4.87	5.38	5.43
June	6.83	4.77	5.17	5.30
September	....	....	....	....
December	....	....	....	....

In most cases the bonds represented between 60 per cent and 70 per cent of the rate base. In general I would say that to be salable a street railway bond should be set up on an even more conservative basis. The same consideration would suggest the importance of unusually conservative escrow provisions, the gradual amortization of a portion of the original issue through sinking funds and a clause in the mortgage assuring adequate provision for maintenance and depreciation. Much objection in the past has been raised to the method of requiring a fixed proportion of gross earnings or property value to be set aside for these latter purposes each year. Several recent power and light mortgages have carried a requirement that responsible engineers certify annually to the trustee that the provision made during the previous year for maintenance and depreciation has in their opinion been adequate or that a definite additional amount should be set up.

Companies Must Offset Past by the Present

The requirements outlined above may seem too rigorous, but the facts must be faced as they stand today. The investing public fared so badly in 1919 and 1920 that it has conceived a strong prejudice against traction securities. Companies which enjoy a monopoly of the mass transportation business in important communities under conditions permitting adequate "wages" to the capital invested, which have built up a feeling of good will among their patrons and whose financial houses are in order can under present conditions find—and for that matter have found—a market for their senior securities. The prevailing high interest return demanded reflects a feeling by investors based on memories of the past rather than on intelligent consideration of present conditions and future prospects.

It is up to the street railways to offset the past by the present. The problem of the modern executive is to sell street railway service to both rider and investor. Full use must be made of active advertising and educational work as a supplement to more attractive equipment and better service. The excellent work the industry has done along these lines has met with an encouraging response and the future seems to hold promise of further improvement.

Track Construction

By CHESTER F. GAILOR
Consulting Engineer, New York City

Structure should be designed for a limited life. Use of T-rail in paved streets is increasing. Important advantages result from the adoption of a standard track structure. The use of more metal and properly designed plates would improve the quality of the average welded joint.

DESIGN of a modern track structure depends primarily upon whether the way engineer favors flexible or rigid construction. The foundation, the ties and the paving are influenced by this consideration. The height and weight of rail and the type of joint, on the contrary, depend more on other factors. There exists a wide difference of opinion concerning the relative merits of different designs of track structure and concerning the individual members which compose it. In these respects it is difficult to discern any very clearly defined tendencies at the present time.

Engineering opinion today is perhaps somewhat in favor of a flexible track structure. Among the important railways now building flexible track are the Boston Elevated, the Brooklyn City Railroad, Public Service Railway of New Jersey, United Railways & Electric Company of Baltimore, Philadelphia Rapid Transit, and Pacific Electric Railway. It is thought by some way engineers that flexible track is less noisy than rigid track, that there is less tendency for the rail to corrugate and that repairs are cheaper than when it is necessary to break up a monolithic mass of concrete. On the other hand, such companies as the Cleveland Railway, the Department of Street Railways, City of Detroit, the Kansas City Railways and the Union Traction Company of Indiana favor an absolutely rigid construction.

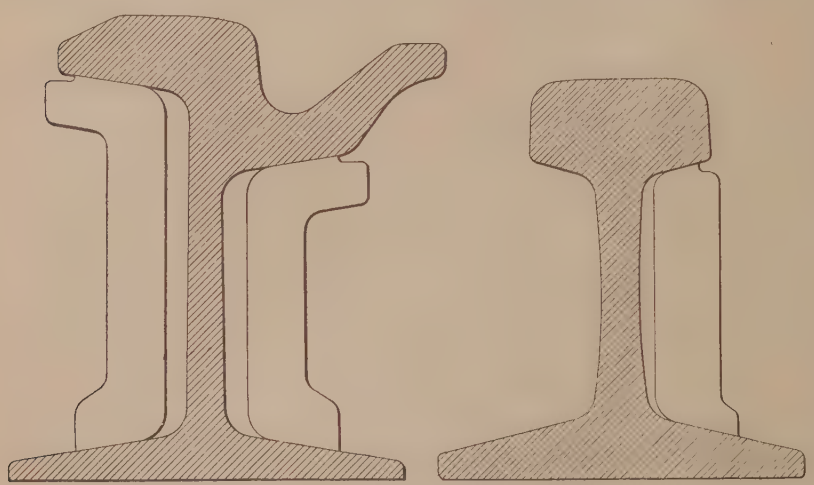
In building modern track, the methods followed and the materials employed differ in various localities, but the object is always the same, namely, to build a structure having the longest possible life for a reasonable cost. The opinion is widely held at the present time that it is both unnecessary and unwise to build track to last indefinitely. Experience shows that it is almost always necessary, for one reason or another, to tear up track at the end of 10 or 15 years and it is therefore a waste of money to design the structure for a 20-year life. If the foundation remains sound during the life of two sets of rails it has served its purpose. One type of construction which has been used by an important system with good results is outlined below as representing the flexible track school of thought:

After the excavation has been made, the subsoil is first thoroughly compressed by means of a steam roller. A layer of coarse ballast is then placed and this also is thoroughly rolled. The best quality of

A Concrete Paving Strip Along the Rail Is Being Tried by the Connecticut Company

wood ties which have been given a preservative treatment are used. Unless the ties are sawn, a flat seat is cut for the rail. The rail is 7-in. grooved girder, A.E.R.E.A. standard section in 60-ft. lengths. The track is surfaced with 1-in. gravel or stone ballast carefully tamped. Joints are welded.

Special care is used to secure a waterproof paving, particularly along the rail. Track drains are installed at frequent intervals. Sub-grade drainage also is used where the nature of the subsoil requires it. Granite block pavement on a concrete foundation is employed on heavily congested streets and around special work. Asphalt or some other bituminous pavement on a concrete base is used in the residential sections of the city. In such localities granite blocks are used as liners along the rail.



Joint Plates Recently Designed to Permit the Use of Welds ½ In. to ⅝ In. Thick

Variations in carrying out the details of the flexible type of construction are many. To secure resiliency it is customary to use rock, slag or cinders for the foundation. In New Orleans, however, where the ground is very soft, the practice is first to place a concrete slab as a foundation for the ballast. Going to the other extreme some railways where the soil is extremely firm have laid their ties directly on the ground. It may be doubted, however, if this is in line with the best modern thought. Most way engineers appear to favor rock ballast foundation, thoroughly compressed, as a base upon which to build a resilient track structure.

Wood ties are generally used in the construction of flexible track, but steel ties have been used on a ballast foundation in a few places and have given good results. When buying wood ties to be buried for years out of sight under the pavement of the street, it is important to secure material of the best quality. Moreover, experience shows that it is well worth while to treat these ties with some chemical preservative in order to prolong their life. It is a fallacy to think that a cheap tie cut from a poor grade of timber, not given a preservative treatment, will reduce track construction cost. A tie once laid in a paved street is difficult to get at and cannot be replaced except at great cost. Yet, if it deteriorates and is allowed to remain in place, it will eventually cause the ruination of the track structure. For that reason only the best should be used.

A growing tendency to use T-rail instead of grooved girder rail in paved streets is plainly discernible. The most popular rail sections are the 6-in. 100-lb. T and the 7-in. 91-lb., 93-lb. and 100-lb. T-rail. The companies which continue to favor the grooved girder rail in numerous instances have adopted the A.E.R.E.A. standard 7-in. 122-lb. section. During the year 1923, for example, six of the more prominent railways in the United States definitely adopted this as standard construction. An exception to this rule, however, is the Pacific Electric Railway, which uses a 7-in. 128-lb. grooved girder section. An example of the construction of this company is shown in an accompanying illustration.

When T-rail is used instead of grooved girder rail, it becomes necessary, of course, to provide a flangeway. This has been accomplished by different means in various cities, depending on the kind of paving used. The method has been adopted in some places where block pavement is used of placing the ends of the blocks under the head of the rail and crowning the pavement between the rails sufficiently to bring the surface up even with the top of the railhead. An objection to this practice, however, is that the inevitable movement of the rail is likely either to loosen or to break the blocks.

Other railways have used nose blocks with entire success. Such blocks, however, are slightly more expensive than plain blocks. In a number of Southern cities wood nose blocks are used. These may be cut at the mill or cut more roughly on the job. With granite block a satisfactory solution of the problem has been found by keeping the headers about 2 in. away from the rail and partially filling in the gap with either concrete or some mastic filler. Where concrete pavement is used it is customary to make a flangeway in the concrete by means of wood or steel templates laid along the rail.

When grooved girder rail is employed, the majority of engineers appear to favor the use of granite blocks for paving along the rail. These are placed parallel to the rail and covered with a mastic or cement filler. Such paving is waterproof and allows a slight movement of the rail without injury to the structure.

A novel form of paving along the rail has been installed by the Connecticut Company in some of its more recent track construction jobs. Strips of concrete have been laid alongside the rails, between them and the pavement. The concrete strip is integral with the rail and separated from the pavement of the rest of the street by a mastic filler. The appearance of such a piece of construction work is shown in an accompanying illustration.

The character of track construction, particularly that of the paving, has an important bearing on the noise of operation. Experience indicates that a rigid structure is usually somewhat more noisy than a flexible one. How important this consideration is each engineer must decide for himself. To a great extent, however, this drawback may be avoided by the use of an asphaltic pavement. On the other hand, it is

Modern Open-Track Construction on the Lines of the Boston Elevated Railway

possible to create a very noisy track structure by combining a flexible design and a type of pavement that acts as a sounding board. Many way engineers advocate an asphaltic pavement with concrete base for streets where the traffic is light, and a granite block pavement with some sort of a mastic coating on the top for streets where the vehicular traffic is heavy.

Modern Practice in Joint Welding

Regardless of all controversies about rigid and flexible track, way engineers today are almost unanimously in favor of welding rail joints. Seam welds, butt welds and thermit welds are widely used and give very satisfactory results when properly installed. Local conditions, among which must be included the possibility of taking track out of service during welding, will largely determine the type of joint.

So-called seam-welded rail joints, to which a name that is a misnomer has unfortunately been given, are now being installed by at least 10 distinctly different processes. Among these are the carbon arc and the metallic arc methods. The former has been followed for approximately 10 years in track welding, but seldom has been used for purposes other than bonding.

Little study has been given by way engineers to the metallic method of joint welding, compared to the amount that has been given to the carbon arc process. Often the only instructions given to the track welders have been to weld the joints with rods, wire, or any available scrap and to make the best job possible. No attention has been paid to the condition or character of the plates or rail sections. An arc weld, no matter how it is done, in the eyes of too many railway officials is a sure cure for all joint troubles.

There are certain general principles involved in either process of arc welding which, if ignored, will cause failure in a remarkably short time. The greatest deficiency in arc-welded rail joints being installed today results from the fact that only one-half to one-quarter of the required amount of welding metal is applied, and most of this metal is not located where it will be of the greatest value. A large majority of the seam welds are only $\frac{1}{8}$ in. to $\frac{3}{16}$ in. thick at the point of contact between the rail and plate. Obviously, this metal being soft and coarse grained, it is not capable of withstanding the strain which occurs to all such points. Experience shows that seams $\frac{1}{2}$ in. to $\frac{5}{8}$ in. thick should be used and no attempt should be made to install a thinner weld. The unsuitability of seam welds $\frac{1}{8}$ to $\frac{1}{4}$ in. thick can easily be demonstrated by allowing a number of cars to pass over such welds where the rail metal above the welds is thin, say $\frac{1}{4}$ in. thick, thus bringing the full load directly on the welds. Only a few passes of cars will be needed to fracture such welds, showing plainly that the weld metal is being subjected to stresses far in excess of those it is capable of withstanding.

Carbon arc welding is being rapidly developed by several way engineers, among whom are H. M. Steward, superintendent of maintenance Boston Elevated Railway; E. M. T. Ryder, way engineer Third Avenue Railway, and W. W. Wysor, chief engineer United Railways & Electric Company, Baltimore. This method requires much more heat in welding than does the metallic method and consequently requires larger and more complicated apparatus, thus increasing the difficulty of the operation. Many engineers have recently modified their carbon arc method of joint welding by using the so-called "hand-feed" process which was developed several years ago in Montreal under the direction of W. F. Graves. This process resembles closely the usual gas-welding operation and is intended to give the operator an opportunity to apply the exact amount of metal required

A Street Intersection and Passenger Platform Alongside the Reserved Strip on Brighton Avenue, Boston

and better to control the location of the weld as the application progresses. It is unquestionably a distinct improvement over the old method where the rod was laid in place and then fused with the carbon arc, allowing no opportunity of supplying extra metal or controlling the operation with certainty.

Gouging or nicking of the rails at the ends of the seams with the carbon arc unquestionably presents a most difficult problem. Metallic arc welding is generally preferred where worn rail joints are to be welded; in fact, it is very difficult to weld successfully old rails and plates with the carbon arc process, due to the uncontrollable action of the arc at the worn spots where the best welds are necessary.

Flexible Track Construction of the Pacific Electric Railway in Pasadena, Using 7-In. 128-Lb. Grooved Girder Rail

While the tests now under way at the U. S. Bureau of Standards are by no means conclusive, they have already proved that no arc-welded joints yet tested possess sufficient strength in the seams, with one possible exception, and that the type, character, and size of the joint plates must be given immediate attention. It seems quite logical to assume that the joint plate should be thickest and strongest at the center where the greatest stresses occur, likewise the best and heaviest arc welds should be so located.

A type of joint plate that will enable the welder to apply welds ½ in. to ⅝ in. thick should be used. Recent designs that answer this purpose satisfactorily are shown in the accompanying sketches. Plates for use with T-rail and others for grooved girder rail are shown. The use of proper plates and soft, pure steel rods which will produce a tough, close-grained weld will unquestionably eliminate many of the uncertainties now prevalent in the making of arc-welded rail joints.

Where it is possible to keep track out of service during the progress of welding operations, butt-welded joints and thermit joints have proved to be very satisfactory. The operations of making these joints have been standardized to a greater extent than is the case with seam-welded joints, and more uniform results have followed the installation.

Interesting work is being done in the design of open track construction in a number of cities, among which Baltimore and Boston are prominent. This type of structure can, of course, be used only where the railway operates on private right-of-way or in a reserved strip. In Boston, from 4 in. to 6 in. of crushed stone is used below the ties. Tie spacing is 2 ft. 1⅞ in. Rails are of 85-lb. A. S. C. E. section in 60-ft. lengths. At street intersections, passenger landing platforms 105 ft. long have been built of crushed stone and hot tarvia with a dry sand finish. The space between the tracks is filled with loam and seeded. This type of construction is shown in two accompanying illustrations.

Advantages of Adopting a Standard Track Design

The most important factor in all track and pavement construction is the care and attention given to the original execution of the work. It is particularly helpful for a railway to adopt a standard type of track structure and to utilize this design wherever possible. Of course there will always be places where special consideration must govern the construction. In general, however, there can be no doubt but that it pays to adopt and install a standard design. The minor savings which might be accompanied by using a little cheaper material here and there are negligible beside the savings which can be accomplished by reduction in the number of sizes which it is necessary to carry in stock.

Moreover, the adoption of a standard will facilitate the work of the roadmaster and his men. Workmen who are building the same kind of track day after day and month after month become much more proficient than those who install one design today and a different design tomorrow. The fact that cars of lighter weight operate on some lines does not justify the use of lighter track construction. Similarly, the fact that at the present time the headways are longer on some lines than on others does not justify the company in installing a lighter design track structure. Where there are great differences in operating conditions on a single property, as for example a railway which operates both city and interurban lines, it will be necessary to adopt more than one standard. Generally speaking, however, the advantages of adopting a single standard track structure outweigh the occasional drawbacks resulting from its use.

In spite of the general need to practice every possible economy in the face of rising labor cost, many railways lack the proper equipment to do efficient track construction work. The industry suffers much on account of such conditions and the individual companies suffer even more. Electric railways today are facing keen competition and it is foolhardy to disregard efficiency and neglect methods that are widely recognized as being economical. Morover, the public always admires up-to-date methods and equipment, while it is quick to condemn and ridicule obsolete operation. A reasonable amount of satisfactory work can be required of a workman only when he is fully equipped with the proper tools. The modern idea in track construction is to provide the workmen with all the necessary equipment and give them full instructions concerning its use.

Freight Service

By T. H. STOFFEL

Railway Department, Westinghouse Electric & Manufacturing Company

Traffic has tripled in ten years. Standardization of rolling stock permits of interline movements. Motor trucks are valuable adjuncts. More refrigerator cars are needed to handle perishable freight. Future prospects are bright.

BEFORE the war a few interurban electric railways were hauling a certain amount of freight, but it is during the last four years that the greatest development has come. Much progress has been made in providing larger and more modern terminals, standardizing rolling stock to permit interline movements without transfer and establishing joint rates.

For comparison, data are presented covering the years 1912 and 1923. The figures for 1912 are taken from U. S. Census Bureau reports, and those for 1923 are conservatively estimated from the last available reports:

	1912	1923
Gross freight revenue	$14,577,203.00	$53,000,000.00
Freight car miles operated	35,749,917	87,250,000
Freight and express cars in service, including motor cars	7,794	15,180
Electric locomotives employed	277	520
Total ton-miles handled	(not available)	1,250,000,000

Net profits obtained vary from 15 per cent to 35 per cent, depending on the amount and kind of tonnage hauled, but it is estimated that a fair average for all interurban lines handling freight will approximate 20 per cent. Such net profit is equal to about 35 per cent on the investment in freight facilities and equipment. These figures are based on the assumption that revenue from freight operation pays its full proportion of the cost of maintenance of roadway, track, equipment, power, superintendence and general overhead, as well as all costs directly chargeable to that service.

Such figures indicate conclusively that the handling of freight by electric interurban railways is not only practicable and profitable, but that the service is highly appreciated by the shipping public. It is also apparent that these lines have a definite place in the transportation scheme of the country, and tests have shown that they are able to render a service which cannot be provided by any other means. It has been found that invariably when additional facilities or equipment are provided, there is an almost automatic and proportionate increase in the tonnage handled.

Considering the small beginning, many electric interurban lines have made marked progress in the past few years in the way of improving service to meet the demands of the public, providing larger and more modern stations, augmenting motive power and rolling stock and standardizing the latter to permit of free interline movement. Joint through rates and service have been established, with the result that in the Central States especially shipments of both carload and less than carload lots are moved expeditiously on through waybills to destinations up to and exceeding 400 miles. Trains of from 7 to 15 or more cars, hauled by locomotives, are not uncommon in this part of the country.

The construction and putting into operation during the past year of the new million dollar Union Freight Terminal at Indianapolis is probably the most notable recent illustration of the progress being made by electric lines in developing freight business and denotes the tendency to provide modern and economical

Fast Fruit and Express Train with All-Steel Equipment, Operated by Interstate Public Service Company

A Mixed Freight Train Drawn by a 50-Ton Baldwin-Westinghouse Locomotive on the Kansas City, Kaw Valley & Western Railway

facilities. This terminal is used jointly by the four interurban systems centering at Indianapolis, with twelve radiating lines. The combined length of the two present freight warehouses is approximately 1,300 ft., with platform track capacity for more than 60 cars at a single setting; separate well-lighted modern offices, including record rooms and up-to-date sanitary arrangements, are provided for each line. In addition, the terminal has team track capacity for 30 cars at one setting and ample track space for car storage. Ground is available also for increasing both warehouse and track capacity when necessary. It is understood that similar improvements are planned at other important interurban centers such as Cleveland, Toledo, etc.

While the basis of charges for freight handling varies in different sections of the country, as a general rule rates in force are no higher than those in effect via competing steam lines; in fact, in many states the public utility commissions designate maximum rates which may be charged for intrastate movement, and these are invariably the same as apply for steam roads. Experience has proved that freight business can be developed to the fullest extent only when transportation rates are competitive, and therefore the majority of electric lines have adopted not only the same rates, but also the same classifications, rules and regulations pertaining to them as those promulgated by the steam lines. An advantage in adopting the steam road rate basis is that it makes it possible to undertake joint traffic movements with the latter without in any way disturbing the rate structure. A number of electric lines have recently successfully negotiated through traffic arrangements with steam carriers, to the benefit of both.

Much has been said and written regarding the competition of the gas-driven motor truck in freight transportation. Investigation usually develops that this competition is not serious nor lasting, except where a jobber or shipper employs his own vehicle to deliver goods to his customer's place of business to meet commercial competition, and invariably this is done at greater expense than if done by rail. As a matter of fact, extremely short-haul business, up to 20 or 25 miles, is not generally considered profitable for any rail line, either electric or steam, due to low rates and the fact that terminal expense per ton is the same regardless of destination. It is also generally conceded that the motor truck can handle freight for such distances, not only more expeditiously, but more economically, and at the same time make delivery at the con-

Freight Hauling in the South. The Piedmont & Northern Railway Operates More than 150 Freight Cars on 200 Miles of Track

signee's place of business, and at an expense to the shipper only slightly more than if consignments were taken to a rail station for forwarding.

There is a possibility that in time rail transportation lines, both steam and electric, will find it necessary to provide pick up and delivery service, at a charge to the shipper or consignee over and above existing station to station rates, but at present the shipping public generally apparently does not desire such service. Practically all important shippers must have conveyances for other work in connection with their business, and these can be used also to move goods to and from freight houses. They do not take kindly, therefore, to the idea of paying an outsider an extra amount for this service.

The principal advantage to the railway company of such service would be the possibility of relieving congestion at terminal warehouses, or postponement of the necessity to enlarge stations. Whenever it becomes necessary for rail lines to establish so called pick-up and delivery service, it is believed that for reasons of economy and efficiency the work should be delegated to a single responsible agency in each locality, to operate from electric as well as steam stations.

Undoubtedly the motor truck has a definite and important place in the transportation of freight, and can be made a valuable adjunct to electric railways. Many possibilities exist for their use as feeders for rail lines, operating between rail head stations and rural districts, or in localities where time of transit could thus be shortened. Such service is already provided by the Detroit United Railway, the Interstate Public Service Company, and others, and has proved an important means of increasing revenue.

It is believed that electric railways could also profitably employ motor trucks in handling shipments, both carload and less, between rail head stations and substations located in jobbing or manufacturing districts of larger cities, which cannot be reached by rails. Such service has been established by the Chicago, North Shore & Milwaukee Railroad and is proving successful. Electric railways could profitably employ motor trucks to render service similar to that of the steam lines, where cars are placed on private sidings of jobbers or manufacturers to be loaded with miscellaneous consignments for various destinations on the line, and when loaded are switched to freight stations and shipments distributed into various line cars for forwarding to destination. The cost of the switching is assumed by the railway company when the aggregate weight of the consignments in the car is 5,000 lb. or 6,000 lb. or more. This relieves the shipper of hauling to freight stations, and permits the railway to make transfer during off-peak periods in the warehouse. Undoubtedly much tonnage could be secured by electric lines by employing trucks to bring the consignments to their freight stations, and by assuming the cost of the service where the aggregate tonnage from a single shipper in a single day amounted to 6,000 lb. or more.

Much thought and consideration has been given recently to the type, capacity and size of freight car most suitable for electric railways on which the standard steam road type cannot be used. Conclusions reached have usually been based on local conditions. It is believed, however, that where lines are doing an extensive through interline business, the most practicable trail box car for general purposes is one of 60,000 lb. capacity and 40 or 42 ft. long, inside measurement, equipped with radial draft rigging and automatic air brakes. The capacity of such a car is approximately 2,200 cu.ft., and this size lends itself most readily to loading of the average shipment. At the same time this car is not too long to negotiate easily the sharp curves in city streets when moved in long trains.

The use of containers of various sizes, which could be loaded on flat cars and thus take the place of box cars, has been advocated for use by rail lines in the handling of merchandise shipments. Several electric railways, notably the Detroit United Lines and the Cincinnati, Aurora & Lawrenceburg Railway, have experimented with them. The advantages claimed for the container system include the forwarding under seal direct from shipper to consignee, thereby economizing in station platform labor and reducing claims for pilferage and damage; lessening chances for shipments to go astray, and relieving congestion at freight stations. In actual practice, however, it was found that available tonnage for a single destination or consignee was often either considerably less than the capacity of a container, or exceeded the capacity of one, making the use of a part of another necessary, in order that the entire consignment might go forward at the same time. This resulted in considerable reduction in the cubical carrying capacity of the car, and at times it was necessary to use two cars for tonnage which could ordinarily be handled in a single box car. Furthermore, the container did not lend itself readily to the loading of the general run of merchandise, and when long or heavy articles, such as iron bars, shafting machinery, etc., were offered, a regular box car had to be used. In addition, the considerable weight of the containers themselves was non-revenue producing, and the disadvantages of the system more than offset the advantages.

One class of available tonnage,

In the Central States Hauling Livestock Has Proved to Be a Profitable Business for the Electric Interurbans

which electric lines could handle most satisfactorily, but which has received very little attention by operators, consists of perishable commodities, such as fresh meats, packing house products, fruits, vegetables, butter, eggs, etc., requiring refrigeration. In some districts long hauls of 200 or 300 miles could be secured if proper equipment were available to handle the business. Practically every interurban railway could profitably operate a daily peddler car or two for perishables. High rates are received for transporting this class of freight and the business is very desirable from a revenue standpoint, but undoubtedly the first cost of providing refrigerator cars and the necessary icing stations has retarded development of this business.

Experience shows that the iced and ventilated car is the only reliable method of protecting perishable commodities in transit. A plan of providing refrigeration without the use of ice, and which may prove to be of vast importance to the industry, is being worked out by the Northern Ohio Traction & Light Company. This line has many calls for refrigerator service, and in an endeavor to supply this want has decided to construct a car along refrigerator lines so far as insulation is concerned, but installing in place of the ice bunkers an electrically operated refrigerator plant, similar to that on the market for use in houses. Cooling pipes will extend along the roof and sides of the car, and vents will be provided near the floor for the exit of warm air. Power to drive the motor will be taken from the trolley, and the car can be kept at an even temperature when standing at stations or en route. If this car proves successful it will mean much to the electric railways of the country. A few roads are successfully moving a considerable tonnage of fresh fruits and vegetables in ordinary cars, where the run can be made in a few hours and delivery effected immediately, but the scope of such operation is extremely limited.

Notwithstanding the progress which has been made by some interurban lines in developing freight business and modernizing methods and facilities to produce economies in operation as well as better service for the public, there are still many opportunities open. Freight stations and terminals should be easily accessible to drays, with sufficient openings to permit prompt loading and unloading and avoid delaying shippers' vehicles. Driveways of ample size to prevent congestion should be provided and team tracks for loading and unloading directly between cars and drays.

Rolling stock should be adequate to take care of all tonnage offered. It should be completely standardized especially in respect to outside dimensions, wheel treads and flanges, draft rigging and air-brake equipment. This will permit free interchange with connecting lines.

It is well to follow a definite program of improvement, including such items as building of tracks on private right-of-way around congested centers and towns, to eliminate sharp curves and to overcome municipal objections to the operation of freight trains in the city streets. This will make possible ultimately the operation of standard steam railroad rolling stock. Meeting and passing tracks should be extended to permit the operation of longer trains and to reduce delays. Hauling more cars per train will effect important reductions in operating expense.

Railways should study the possibility of securing return loads and reducing non-revenue car-miles. Joint through rates and traffic arrangements with connecting lines should be negotiated. The use of the motor truck as a feeder in either urban or rural service is worthy of careful consideration. It may sometimes be possible to secure the location of industrial establishments along the electric railway line.

An efficient traffic department with a competent head should be organized. He should have full authority and responsibility, and the co-operation of the transportation department should be accorded him. Co-operation with agricultural organizations, farm granges, livestock associations, and the like, will help them to secure better markets for their products and at the same time will increase the revenue of the railway.

On the Youngstown & Ohio River Railroad the Freight Business Is More Important than the Passenger Traffic

Equipment Maintenance

By FRANK M. BRINCKERHOFF

Consulting Engineer, New York, N. Y.

A modern shop may be small but should be provided with the last word in labor-saving equipment to keep cars on the road. Some of the important considerations for expediting inspection and overhaul work discussed. Proper areas of floor space, use of lye tanks, provision for paint spraying and spray washing, adequate materials handling and dipping and baking equipment among practical features of shop design treated.

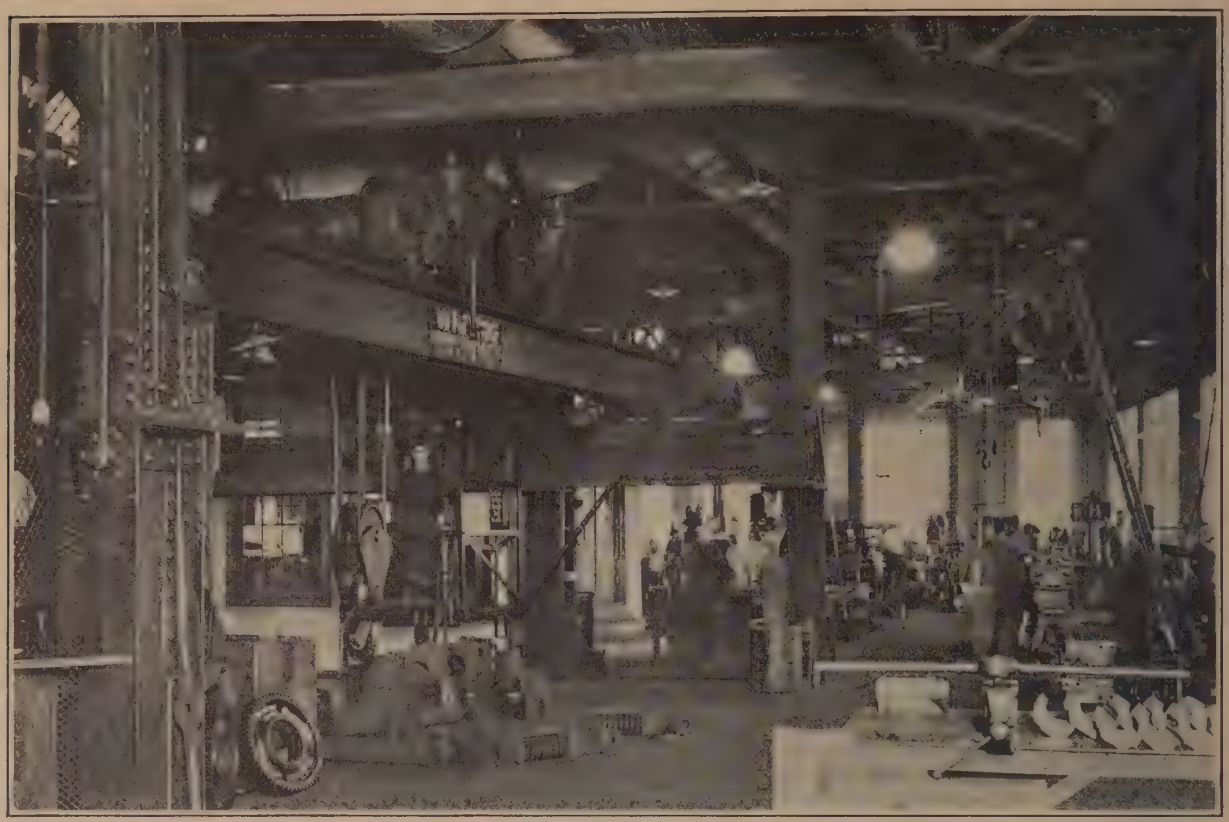
THAT cars are too valuable to be held in shops for long periods of time should be the governing principle on which the design of a modern electric railway repair shop is based. The modern shop may be small but equipped with every known practical device for making repairs quickly and returning cars to service speedily. It should be virtually empty as far as cars are concerned, for they should be kept on the road, where they can earn money. The number of spare cars should also be kept low, but the number of spare parts for the equipment should be large enough to insure prompt replacement. The real function of the repair shop is to keep the cars in service. One car costs $15,000 or more. To keep this investment working as nearly full time as possible justifies quite an investment in spare parts and shop equipment. Also, it is strongly advisable to have more spare parts and fewer spare cars. If this policy makes it possible to provide a given service, say with 10 spare cars instead of 15, the saving is obvious both in the investment in cars and in the investment in shop buildings.

The first thing to be decided by railway officials who are confronted with the problem of constructing a new shop is that of location. Shop arrangement will necessarily be affected by the amount of land and its location. In most cities satisfactory sites are quite limited. It is desirable to locate a shop so as to reduce non-revenue mileage and to obtain a steam road connection if possible. The shop should also be readily accessible in order that labor can be obtained and retained at average wages. In analyzing labor conditions on a number of railway properties, it appears that some find it necessary to pay above the average prices for labor due to the inconvenient location of the shops. They also find it very difficult to keep their men for extended periods. This is quite a disadvantage and it materially affects the quality of the maintenance work.

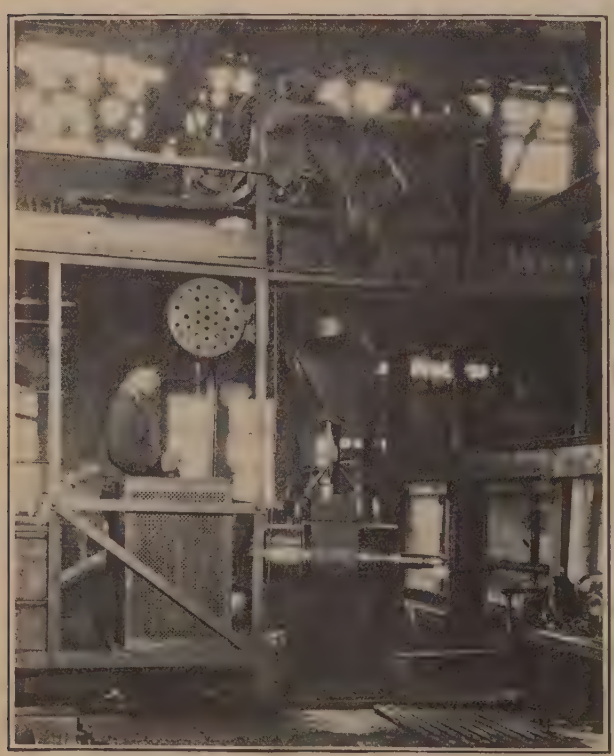
In deciding on the size of a site, it is desirable to select one having sufficient area to provide for outside storage and to permit of enlarging the building to take care of future growth. There are many classes of material, such as wheels, iron castings, lumber, scrap and the like, which can be conveniently stored outside, and this is better than to have them occupying valuable space under a roof. It is also common practice to make use of the shop yards for storing track material, so it is necessary to have a plot of ground considerably larger than that required by the shop building.

A study of existing layouts on a considerable number of representative properties shows that the relation of the total shop area to the number of cars maintained runs fairly uniform. Figures for 10 railways are given in Table I, and the average square feet per car floor area for these 10 railways is 207. In this analysis no attempt has been made to consider the variation in space needed by different length cars. A very exhaustive study of

A Platform Level with the Car Floor Has Been Found of Great Advantage in the Shops of the New York, Westchester & Boston Railway



Supporting Construction to Enable the Crane to Run Over the Balcony for Landing Material in the Shops of the Hudson & Manhattan Railroad



In the Shops of the Hudson & Manhattan Railroad Armatures Are Picked Up from the Truck Overhauling Floor by Means of an Overhead Traveling Crane and Are Landed Directly on the Balcony, Where Repairs Are Made. From This Point an Overhead Telpher System Picks Up and Conveys the Equipment Directly to the Machine Tool on Which the Work Is to Be Performed

the arrangement and size of departments now being used by 50 electric railway properties was made by the equipment and building and structures committees of the American Electric Railway Engineering Association in 1921 and 1922. Based on the figures obtained in this survey, a table has been prepared showing the relative area of departments desirable for roads operating 50, 200 and 1,000 cars respectively. This information is given in Table II. These figures may be taken as a guide for approximating desirable areas where new shops are to be constructed, but individual ideas of designers and local conditions will affect the arrangement and proportioning of shop areas to a large extent.

In general, it can be said that a modern railway shop should be wide rather than long, so that cars can be run in and out without interference. Through tracks with ample connections at both ends are desirable.

The larger electric railway properties have a number of shops, some of which are devoted to special classes of work. In general, the maintenance of cars can be divided into three classes of repairs. First, there is what is commonly called inspection work, which includes renewals, replacements, adjustments and lubrication of wearing and adjustable parts together with a general inspection of the car body, truck and equipment. The second class of work includes what is generally termed overhauling. This includes the dismantling and thorough cleaning of the equipment parts, together with the renewing and replacing of all broken and worn parts. The third class of work may be termed general repairs. This includes the reconstruction of cars, together with repairs, such as painting, varnishing and work which necessitates holding the cars from service over an extended period. The various classes of repairs are sometimes combined so as to coincide as to time.

Sometimes the three classes of repair work are done at one shop, and of course its size and the arrangement of departments will be influenced by the scope of work to be done. There is also a considerable amount of maintenance repair that is generally concentrated at the one point. This includes the rewinding and repair of armatures and fields, the overhauling of controllers, circuit breakers, resistances and other equipment parts, together with such work as the babbitting of bearings, repairs to seats and curtains and the general manufacturing work which is usually carried out by electric railways in order to provide maintenance parts. A discussion of the equipment and arrangement of all the various departments would consume more space than can be devoted to this subject in a single article. But a discussion of some of the outstanding conveniences which should be in use in a modernized electric railway shop will be of value.

TABLE I—RELATION OF TOTAL SHOP AREA TO NUMBER OF CARS MAINTAINED

Railway	Shop Area, Square Feet	Number of Cars	Square Feet per Car
Boston Elevated Railway, Everett Shop	493,478	2,535	195
Montreal Tramways, Youville Shop	112,052	570	197
Milwaukee Electric Railway & Light Company, Coldspring Shop	284,600	1,190	240
Indiana, Columbus & Eastern Traction Company, Springfield, Ohio, Shop	45,680	200	228
Pacific Electric Railway, Torrance Shop	296,880	1,800	165
Portland Railway & Light Company, Portland, Ore.	142,950	640	223
Seattle Municipal Railway	87,810	450	195
Toronto Transportation Commission, Hillcrest Shop	223,226	1,153	194
Union Traction Company of Indiana, Anderson Shop	79,710	300	266
West Penn Railways, Connellsville Shop	50,250	300	168
Total	1,816,636	9,138	
Average			207.1

Lye Tanks for Cleaning Metal Parts

Quite a number of electric railway shops are provided with lye tanks for cleaning the grease and dirt from various equipment parts. Their use reduces the time and labor of overhauling enormously. The Kansas City Railways and the New York, New Haven & Hartford Railroad at its Van Ness shops have large tanks of sufficient size to dip complete motor truck frames. The Kansas City tank is 14 ft. long, 10 ft. wide and 6 ft. deep and is installed at one side of the track on which trucks are stripped for overhauling. Results show that a truck that has been through the lye vat is assembled in from 10 to 15 per cent less time than one that has not.

The New York, New Haven & Hartford Railroad has a separate building containing its lye vat at the Van Ness shops. This is adjacent to the repair shop and is connected to it by transfer tracks, so that material may be handled between the two points with a minimum amount of labor. The building is 43 ft. x 30 ft. and is of concrete, waterproofed on the inside.

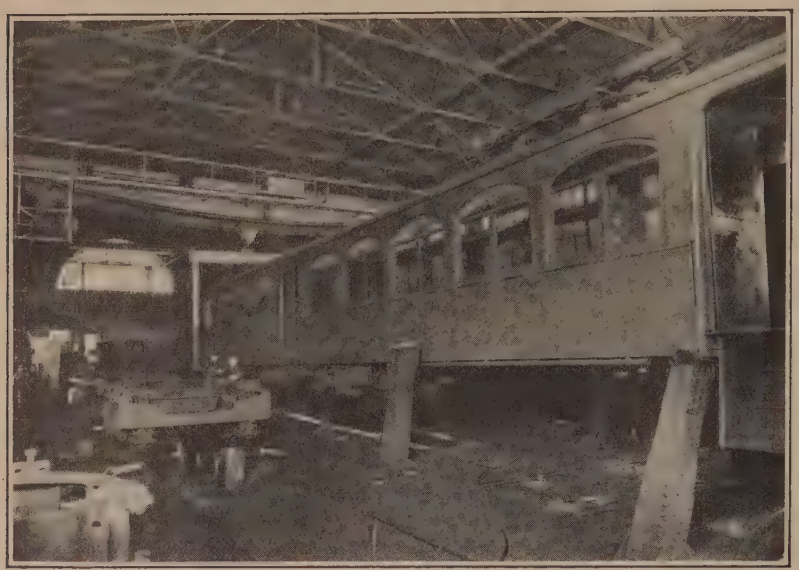
The New York Municipal Railway cleans all of its air compressor parts in a lye tank, 41 in. x 32 in. x 31 in. All parts except gears, pistons, crankshafts and connection rods are placed in the tank and are allowed to remain for half an hour, when they are removed and brushed briskly with a hand brush or broom. Then they are rinsed in water and placed on the overhauling bench. Such a tank is also found to be a great time saver in removing the insulation from field coils where these are to be torn down and reinsulated. Another use for such a tank is that of removing the paint from signs which are to be relettered. After a railway shop is provided with such equipment, many uses can be found for it which were not thought of before.

Spray Washing for Cars

While the washing and cleaning of cars is not always taken care of by the mechanical departments of railways, still it appears that some efficient provision should be made in shop construction for car washing. One of the most efficient methods which has been incorporated in several electric railway shops consists of using vertical perforated pipes

TABLE II—DESIRABLE AREA OF SHOP DEPARTMENTS

Departments	Per Cent of Total Area	Area, Square Feet 50 Cars	200 Cars	1,000 Cars
Overhauling and truck	19	1,966	7,866	39,330
Machine, wheels and axles	9	932	3,726	18,630
Blacksmith and welding	4	414	1,656	8,280
Air brakes	1	104	414	2,070
Office	2	207	828	4,140
Armature and electrical	5	517	2,070	10,350
Carpenter and mill	22	2,277	9,108	45,540
Paint	18	1,863	7,452	37,260
Paint mixing	2	207	828	4,140
Sand blast	2	207	828	4,140
Storeroom	12	1,242	4,968	24,840
Oil house	2	207	828	4,140
Wash room	2	207	828	4,140
Total	100	10,350	41,400	207,090



An Overhead Traveling Crane Lifts the Car Bodies, Which Are Held in Their Raised Position by Steel Supports While the Trucks Are Run Out and Placed on the Adjacent Overhauling Tracks. Turntables in the Floor Provide for Removal at the Side of the Car

located on either side of a track. Water is sprayed on the cars as they pass between these pipes, and men with brushes rub down the sides and windows. With this construction it is the usual practice to obtain the water directly from the city system.

The valves for operating and controlling the flow of water are manipulated from the floor by one man, while it is usual to have two others to scrub and loosen the dirt. The man operating the car stays inside during the washing and takes the car away as soon as it is completed. Average figures obtained from railways using this method show that ordinary sized cars can be washed in from 2½ to 3 minutes and the installation of such equipment produces substantial savings.

In connection with the cleaning of cars it appears that full advantage has not been taken of the economies to be gained from vacuum cleaning. Probably the most notable example of the use of this type of equipment is in Cleveland. In this shop one cleaner is used in the washroom of the paint shop for removing dust and dirt from car interiors previous to painting and varnishing. This method could be extended to the cleaning of cars on ordinary maintenance inspection to good advantage in other railway shops. The removal of dust and dirt from inaccessible places, such as corners, window pockets and underneath seats, is almost impossible with a broom or brush, but a vacuum cleaner with a small nozzle reaches such places readily, and there is also freedom from discomfort to workmen, which is a particular disadvantage where a brush or broom is used.

In the Cleveland shop, vacuum cleaning has been extended to other departments. Thus, in the motor repair shop a cleaner is used to remove the dust and dirt from motor frames preparatory to overhauling, and in the armature room, the armatures are blown out and at the same time the dirt is drawn off by connection to the suction end of the cleaner.

By Having the Trolley Repair Department Located in the Balcony with a Footwalk on a Level with the Roofs of the Cars Much Time Is Saved in Making Inspection and Repairs of Equipment in the Shops of the New York, Westchester & Boston Railway

Provision for Spray Painting a Modern Requirement

The cost of painting the various parts of car equipment can be brought back to a pre-war basis by the use of paint-spraying equipment. Many roads which are now using this system report that the actual time of painting has been reduced to approximately one-third of that required by the old hand brush method. There is still considerable room for reducing the time required in drying paint. A modern shop should have heating facilities for this purpose.

In connection with the use of paint-spraying equipment several problems present themselves, for in order to obtain the greatest advantages, it is necessary really to design the paint shop particularly for this work. Many railways which are now using paint-spraying methods report that with adequate and proper facilities the time consumed in painting could be reduced still further. Most railway shops are designed without adequate space between the centers of tracks to provide for efficient use of paint-spraying equipment. This is a great handicap. The distance between track centers should be not less than 15 ft., and it is desirable to have this 20 ft. or more if the space can be obtained.

There are several reasons for the need of increased space. One of the principal ones is the need for adequate scaffolding or movable platforms, so that the paint spraying can be done economically. Many roads have installed very ingenious de-

signs of platforms in their painting department, but in general most of these are affected to a considerable extent by space limitations. Another reason for an increased spacing of tracks is to avoid fumes from spray painting and to prevent the interference of one class of work with another.

If paint spraying is to be carried out in the most efficient manner, the shops should be piped with a supply of compressed air with convenient outlets, so that this can be used in connection with the paint-spraying equipment without the necessity of running long lines of hose which must be carried over the floor and up to the platform, taking up valuable space and also requiring considerable time in their movement and adjustment and difficulty in avoiding leaks.

In Rochester the paint shop is piped not only with a supply of air but also of gas, so that a combination of air and gas is used to burn off the paint from the car body.

The most effective use of paint spraying at present is on trucks and for the priming coats of car bodies. Railways which are using this system extensively report that the spray gives a better penetration than a brush in the cracks and nail holes, and therefore holds the putty and surfacer much better than the brush methods.

In regard to platforms particularly adapted for spray painting, many roads have found a movable platform, or rather a tower mounted on wheels, of great convenience. The operator pushes this along the side of the car as his work progresses and thus does not need to move from his position. Such movable towers, however, require more space between tracks than is ordinarily provided in paint shops, and this is an added reason for increased track centers where new designs permit.

Repair Department Should Be Convenient for General Overhauling

A modern shop should be small and equipped with every known practical device for making repairs quickly.

The work of repairs to the car equipment must be carried out on various levels. Thus, there is equipment underneath the car body and on the truck, inside the car and along the outside of the car, and also on the roof. This particular phase of repair work has been amply provided for in the design of the New York, Westchester & Boston repair shop. In this shop provision is made for three different levels of work. No scaffolding or ladders are necessary, and their absence materially adds to the rapidity of operation and the freedom of various groups of workmen as well as to the general appearance of the shops.

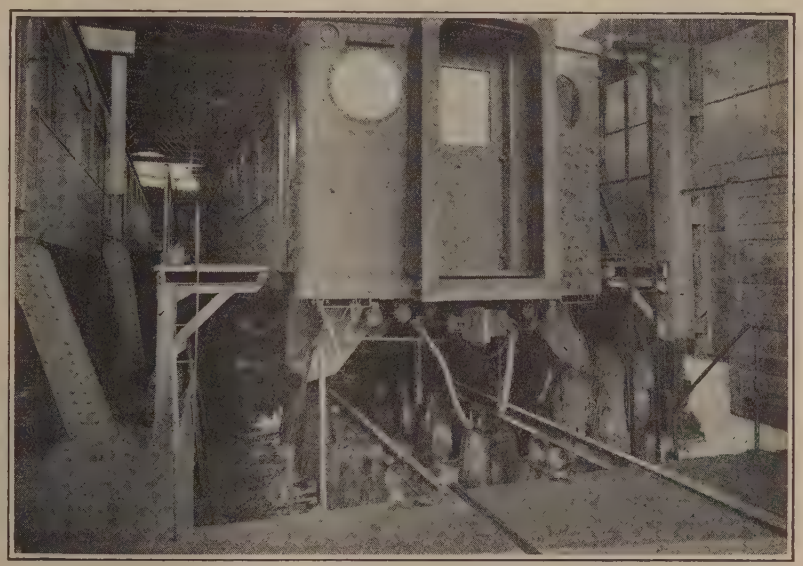
Repairs and inspection of the trolley bases, wheels and poles must necessarily be made on the roofs of cars. It certainly adds to the arduousness of the employees who do this work if they are required to climb up and down repeatedly from the floor to the roofs of cars. In the New York, Westchester & Boston shops a walk is provided along one side of the shop on a level with the car roof, and the department where trolley equipment is repaired is in the balcony leading off from this walk.

Men can thus bring any material to the benches for repairs without carrying it up and down ladders. Also, repairs on the trolley equipment itself can be carried out much more efficiently by such an arrangement. The use of a permanent platform on the level of the car floor for cleaning windows and for convenient access to the body generally has proved of particular advantage in this shop.

Pit construction has been given considerable study by various electric railway men, and in general the ideas in this connection are well advanced. All realize the advantage of having open space at the sides of the cars as well as underneath, an open pit construction with a walk in the center between the two tracks having been found to work out most satisfactorily.

Material-Handling Equipment Important

One of the principal factors in the rapid repair of equipment is provision of cranes, telphers, hoists and the like for handling and transporting parts to the particular locations at which they are to be repaired. The work starts with the removal of the car bodies from the trucks and continues through the dismantling of the equipment and removal of individual parts to the particular tools at which the work is to be done. In deciding on the best type of equipment for any particular shop, some of the points that should be given consideration are initial investment, time required for doing the work, adaptability to other services in the shop, convenience of operation and accident hazards. There is no doubt that an overhead traveling crane is the most efficient and convenient means for removal of car bodies. Certainly, in equipping a shop which is modern in every respect, this should be included. It is better to put the money into the best means of doing a job in the shop than to invest a smaller sum in a slower, less



A Type of Pit Extending Outside the Cars and Having Rails Supported on Concrete Piers Gives Convenient Access to All Under Body Equipment in the Shops of the New York, Westchester & Boston Railway

efficient substitute which may delay the return of a car to service.

The overhead traveling crane has the advantage that it can be used for handling heavy parts and dismantling or assembling the equipment in the truck shop, as well as for lifting car bodies, and thus can be kept in almost continuous service.

As an auxiliary to the overhead traveling crane, a complete system of traveling telphers is desirable. Through the use of such a system the various detail parts can be taken up from the floor of the overhauling shop and delivered directly to the machine tool on which the work is to be done. Such a system should connect the various departments and run adjacent to the principal tools. In addition, ample equipment of jib cranes and hoists will be necessary in order to provide for the lifting of heavy parts into and out of the machines.

Such equipment, however, is only a part of that required for material handling. The use of truck tractors by electric railways is infrequent, but these can be used to great advantage and with material reduction in cost of labor. Several of the larger electric railway systems are using truck tractors and find innumerable uses for them.

It is not the intention to go into the desirable grouping and arrangement of departments in a shop, but this is a matter which should have very close attention. The arrangement of shop departments is frequently responsible for double handling of material and the necessity of transporting some pieces of apparatus through another department before they finally reach the machine on which the work has to be done.

The dipping and baking of railway armatures and the impregnating of field coils have now become quite general practice among electric railways. Hence, in laying out an up-to-date shop ample provision should be made for this work. The equipment recommended consists of an insulated oven with forced ventilation and thermostatic control of the heat, a dipping tank for armatures and an impregnating tank for field coils. In addition, an overhead trolley system should extend from the dipping tank into the oven. Where material handling trucks are provided, these can be used to transfer the equipment in and out of the oven.

Large economies in the maintenance of rolling stock can be realized by making special provision for reclamation work. For salvaging material and reworking it for further use, the various types of welding equipment are the main items needed. Parts which are to be scrapped are most quickly cut apart by the oxyacetylene or arc process. Work of repair such as building up worn surfaces and welding broken parts now constitutes the major part of electric railway reclamation work. The Washington Railway & Electric Company has a system of wiring such that leads from the welding room equipment can be brought out and work done in most any nearby location.

There are many other departments, in addition to those which have been considered in this article, which should have careful consideration in planning a modern shop. Such features as are necessary for ample lighting, ventilating and heating systems could each well be given as much space for consideration as has been given in this article. The intention here, however, has been to point out only a few of the high points of a modern electric railway shop layout.

A Balcony Over the Machine Shop Gives a Very Efficient Arrangement of Space in the Shops of the New York, Westchester & Boston Railway

Accounting Practice

By W. L. DAVIS
Auditor Lehigh Valley Transit Company, Allentown, Pa.

Different economic conditions, regulation and the growth of the industry are responsible for many changes in accounting matters during the last twenty years. This article considers methods of organizing the staff, handling distributions and selection of forms. Later articles will consider modern methods of arranging the ledger accounts, preparing the reports, divisional accounting, budgets, capital records and other matters.

THOSE of us who have spent the past twenty years in electric railway accounting have had to keep pace with the numerous changes and developments through which the industry has passed during that time. Different economic conditions and governmental and municipal regulations have been responsible for some of these changes, but the normal growth of the industry has been one of the principal factors.

The primary functions of the accounting department during this time have been the preparation of financial data, such as balance sheets and income accounts, and the compilation of a history of the company. These functions still remain and will continue to represent the main responsibility of the men in charge of the accounting branch of the industry. The modern railway accountant, however, does not and cannot consider that his duties are those of an ordinary bookkeeper, the problems of the industry at the present being such that he must assume much larger responsibilities. He must be prepared to furnish all kinds of cost analyses both for operating and construction purposes, to compile regular reports and special data for regulatory commissions, and to handle numerous other requirements unheard of twenty-five years ago.

A survey of the accounting requirements of the modern electric railway should begin with a review of the essential qualifications of the modern electric railway accountant. The man in charge of this work should have the necessary technical education both as to accounting and finance, together with a fund of practical knowledge that can only come with experience. While he should not be expected to be familiar with all of the problems of the maintenance of way engineer, the superintendent of the distribution system, the master mechanic, the power station engineer or the superintendent of transportation, he should know enough about the work in the various operating and construction departments to pass intelligently upon such accounting problems as may present themselves to him. He should supplement his knowledge of the industry and his own branch of it by being thoroughly familiar with operating conditions on his property.

The auditor should also keep himself advised not only on general economic conditions but also on the industrial situations in the territory through which his company operates. Briefly speaking, he should be a man who is thoroughly competent to handle his own department, who can make the proper decisions at the proper time and take full personal responsibility for them, who merits the confidence of the executives, and who can organize and supervise the work of those to whom he delegates a part of his responsibility.

As the auditor is responsible for the accounting records of his company he should provide himself with not only a competent staff of assistants but also a comprehensive accounting system suited to his own requirements. He should be familiar enough with his own problems and requirements to handle both.

The Accounting Staff

It is not an easy matter to develop an accounting organization which can meet the complicated problems of the present day, and in doing so the auditor should profit by the lessons learned during the past years. The average man entering the service of the accounting department of an electric railway seldom has any previous experience in that direction, and considerable educational work is necessary before the new employee can be intrusted with anything other than routine clerical work. It might also be added that the new employee should also be encouraged to familiarize himself with the property of the company.

Every electric railway accounting department is required to prepare from time to time numerous special statements, exhibits, analyses and the like, and it is usually necessary to assign this work to the best men in the department. As this kind of work must usually be given preference over routine requirements, it will be found advantageous, particularly in the larger offices, to provide for this in the accounting organization. This can usually be done to advantage by assigning the newer employees to the routine work and relieving the older and more experienced men of as much detail as possible, assigning them to the special work as required.

The routine work should of course be handled under the supervision of an experienced man, to whom the auditor should delegate as much of his detail responsibility as possible. The men to whom the detail work is intrusted should be instructed to develop the newer men to such an extent that, when the time comes for promotion, there will be plenty of valuable talent available. The special men should be recruited in the

same fashion, thereby utilizing the experience of the older men to the best advantage and enabling the organization to develop within itself.

The extent to which this method can be advantageously used depends of course upon the size of the organization and the amount of work of all kinds required of it, but any accounting organization should be flexible enough to take care of special work, annual reports, vacations and time lost through illness or accidents, and if there are enough people to handle these requirements the routine work and the daily and monthly reports compiled therefrom are subjected to a minimum of delay.

There should also be at least two men familiar enough with the requirements of the department and the policy of the company to handle the work required of the organization in the absence of the auditor. The auditor should consider the development of such men his personal responsibility and should go out of his way to see that their education along the lines of his own work is as complete as he can possibly make it. In this respect the man in charge of the department should subordinate his personal convenience to the requirements of the service and should consider it a duty to provide the company with some one who can take his place.

The proper development of the modern accounting organization is predicated upon a proper selection of personnel, and the auditor should consider this a most important branch of his work. This is a very broad subject and one upon which books have been written, and it is of course entirely outside the province of this article to discuss it in detail. It might, however, be well to say at this time that the employees should be selected and trained for the positions that they are expected to fill, and toward this end their past experience and personal preferences should be carefully considered. It would be manifestly unfair to place a man whose past experience might only have covered storeroom accounting upon general ledger work and expect him to make good, and on the other hand a man with an exceptionally good line of experience upon general books could hardly be put on a routine job in another department and be expected to stay with the organization.

When the new man is employed, or even before he is employed, he should be informed of just what is expected of him, and he should be given all possible assistance in that direction. On the other hand, he should be told just what he may expect, and if any promises are made to him they should be fulfilled to the letter. He should be employed with the idea that he is becoming a member of an accounting organization and taking up a share of the responsibilities of the department.

Every employee should be given to understand that he cannot be advanced in the organization until he qualifies for such advancement and until the opportunity for promotion presents itself. When such an opportunity does present itself the position should be filled from the organization whenever possible, but this probably should not be an inflexible rule. It is sometimes desirable to inject a little of what is usually called new blood, as new ideas are often very necessary, but the men in the organization should always be encouraged to develop themselves for something better. Above all, a competent, conscientious and loyal employee should not be kept on one job indefinitely with no opportunities to improve himself or his position just because he does happen to be fitted for his work and because he is making good on it.

There have been numerous cases of employees being kept in the same positions indefinitely because "they couldn't be spared" until other organizations discover what they can do and make offers that are soon accepted. It is usually the valuable employee who does not make his presence known from year to year as he keeps on doing his work, but that is no reason why he should not be considered for promotion or a better position just because he is competent on his present work. A failure to promote a man of this kind to a better position may temporarily save the auditor a little work and personal inconvenience, but when the time comes to fill both positions he may remember the circumstances to his sorrow.

A competent staff (and an economical staff) is a well-satisfied staff, and it is hardly possible to build up the former without the latter. A well-satisfied staff is not made so without a fairly liberal salary policy, but the salary policy is not the only element. The employees should be encouraged to develop themselves, should receive all possible assistance toward an education in the requirements of their work, should not be misled by false promises or statements, should have the most pleasant and satisfactory working conditions possible, and should not be expected to do the impossible. Merit should always be recognized and incompetence should always be handled in the most effective fashion.

While the employees should not expect (and the better employees do not expect) to be continually complimented for doing what they are paid to do, a friendly word of appreciation often goes a long way. Criticisms should be given tactfully and with some regard for the feelings of the other fellow, always bearing in mind that the employee didn't make the mistake intentionally and is usually anxious to correct his own faults.

When an employee is requested to prepare a statement or do some extra work that is apart from his usual routine, he will usually handle it better (and more quickly) if he not only knows what to do and how to do it, but why he is doing it. If the employees in the accounting department are well satisfied they will not only do better work in a more efficient manner, but will also prove valuable "boosters" for the company on the outside.

Comparison with Older Methods

Before discussing the subject of modern methods in accounting, it might be said that the present-day requirements of the industry are such that the records must be kept in an entirely different form than those considered satisfactory twenty-five and thirty years ago. The accounting records should not only provide the necessary routine for preparing periodic profit and loss statements and balance sheets, but should also reflect a more or less complete history of the operating, construction and financial transactions of the company.

In order to accomplish this end, it may seem, at first glance, that there would not be much room for economy of time and labor when comparing the modern records with the old-fashioned bound ledgers, cash books and journals of an earlier day. It is true that our present requirements are such that the records must necessarily be somewhat more elaborate, but if the auditor is familiar enough with his

own conditions and has the necessary knowledge of detail he can often make one entry serve more than one purpose and thereby effect a substantial saving in expense.

As the work in the general offices is such that the final results depend to a great extent upon the daily transactions as recorded in the operating offices, any efforts toward reducing work and effecting economical accounting methods in handling modern requirements must begin at the source. The basic figures, from the very nature of the work, must be compiled daily, and if this feature receives sufficient attention it will be found possible to handle the work economically and at the same time avoid peaks at the end of the accounting period. The present-day auditor, in devising his accounting systems, will find it of considerable advantage to avoid, as far as possible, the practice of allowing important work to wait until the end of the month. This is especially true of payrolls and material distributions, not to mention credits to revenue accounts for daily earnings. This is, of course, subject to some limitations, as it would be manifestly unnecessary to attempt a daily compilation of a small payroll or material distribution, which, from the nature of the work and the size of it, might be done in a half day's time at the close of the month.

Simplifying Payroll Distribution

In preparing payroll distributions it will be found advantageous to enter the time of each man each day and charge it to the proper accounts, preferably by dollars and cents, but at least by hours. This in turn requires each employee to prepare, or some one to prepare for him, a daily report of his time on which a complete description of the work is shown. The usual form of time ticket may be supplemented by an extra column in which can be shown the allocation of the amount earned each day, these amounts being accumulated daily by accounts. If the charges are made and accumulated daily, it is not only possible to arrive at a total of the payroll distribution within one day after the close of the accounting period, but it is also possible, if desired, to prepare a daily report of operating costs. It is desirable to summarize the daily charges from the time tickets of the individual employees to each operating expense or construction account and have these totals subjected to daily accumulation. The department head may then be in a position to review each day's payroll costs and have a thorough understanding of his labor charges as they are incurred, instead of being required to wait until the close of the accounting period to find out what is included in his costs.

The monthly payroll distributions as forwarded to the general office should be prepared on standard forms. Such forms should provide spaces for the charges to each controlling account, the number of controlling accounts depending entirely upon the requirements of the company. It will be found very advantageous to draft this form in such a way that the charges to the various detail accounts under each controlling account may be grouped and sub-totaled accordingly.

If there is only one payroll distribution, such as might be required in a small property, a printed form is not essential, but if a number of payroll distributions are used a printed form will be found very valuable. These forms can be ruled so that the charges are grouped automatically by detail and controlling accounts, thereby making it very easy to prepare a summary of the payroll distributions to be used as a journal entry. The totals by control accounts shown on the summary may be posted direct to the general ledger and the detail accounts to a detail ledger. Each section of the detail ledger may be balanced separately with its control account and the difficulties sometimes encountered in preparing a payroll distribution journal entry reduced to a minimum.

If divisional accounting is used, the detail ledger sheets may be prepared accordingly in columnar form, with the description, total and reference columns on the left side. The monthly charges from each payroll may then be entered and the total charges to each operating and construction account determined accordingly. These totals can then be transferred to the operating and construction ledgers in one item with the assurance that they are in balance.

If the company is maintaining a fixed capital record, it is very important to have a system whereby the charges to fixed capital accounts may readily be analyzed, and if the charges to the various construction accounts can be readily supported by comprehensive analyses of the work by man-hours and amounts, the preparation of monthly cost analyses will be materially facilitated. The daily record of man-hours and amounts will also be found to be of advantage in preparing analyses of operating costs, cost curves, and similar data, together with estimates for budgets and other purposes. It will therefore be seen that one set of records, if made properly and kept up to date, may be used for different purposes, even though the basic figures are only entered once.

Material Distribution and Fare Collections

Material distributions may also be handled in much the same way. Daily distributions of material issues may be summarized by accounts, and the total charge to each operating account may be readily determined with comparatively no delay at the close of the accounting period. These daily distributions may be summarized both by accounts and by articles, thereby enabling the company to keep a very complete record of material costs by articles and amounts, not only representing debits to operating and construction accounts, but also credits to the stock accounts. If it is not considered necessary to prepare such details daily, they may be prepared on a weekly or monthly basis, but it will be found preferable under ordinary circumstances to prepare them daily.

The monthly material distributions when reported to the general office may be summarized upon the same kind of a form as has already been suggested for payrolls, and it will be found advantageous to use the same form with different headings, thereby reducing the number of active forms in use.

Complete daily records of material issued may also be used for a number of different purposes, particularly in the preparation of cost analyses for fixed capital records, and if the routine records are self-analyzing they may be reviewed at any time by any officer or employee who may be interested.

The same general principle may be used in accounting for fare collections, whether cash or tickets. As the operations are usually handled on a divisional basis, the

accounting should of course follow the same course. No matter what form of registration may be in effect, it is necessary to account for the fares collected in the most complete manner possible.

In this article no attempt will be made to discuss the numerous forms of fare registration, as that is a subject in itself and one which each company should decide for itself. However, it might be well to suggest that the accounting for the receipts be handled in such a way that every fare may be accounted for, and this can best be attained by a method which enables the accounting department to compare the fares registered as reported by the conductors with similar data prepared from records taken from the cars.

Conductors' trip sheets should show the number of cash fares and revenue tickets collected on each car, and this record can be supplemented by a daily record of registration showing the number of fares collected on each car by each conductor. When the conductors' returns are audited and the cash and ticket collections of each conductor are compared with the trip sheets or trip reports, the collections on each car can be determined without much additional work, for the reason that the registrations are necessarily reported by cars. Forms can be prepared for this purpose and the fare collections by cars compiled along with divisional earnings, car-miles, car-hours and other statistical data.

On the other hand, the records prepared by cars can be summarized in accordance with the number of fares collected by each conductor, and one record compared with the other. If the form of registration does not furnish the accounting department with data from which the registration by conductors may be determined, this information may be had from cards which stay with the car and which show opening readings as taken by carhouse employees, readings taken when conductors change off, and closing readings taken at the end of the day.

If each day's collections are audited in this manner, every registration can be accounted for and each day's earnings can be determined on the day after. The general accounting department can take the daily collections direct into the income account, either on the basis of cash collections, ticket sales or tickets lifted. Even if tickets lifted are not used as a basis of determining each day's earnings, the revenue tickets should be accounted for.

In taking the earnings into the general accounts, divisional segregations may be made as required, and if this information is needed, it should be prepared at the time the daily collections are audited. This subject will, however, be discussed later.

Proper Selection of Forms

In order to handle the work of a modern accounting department in the most efficient manner, special attention should of course be given to the preparation of standard forms. This is a subject which, in the past, has not received the attention that it should have had, and as a result, there have been hundreds of printed forms produced without any uniformity as to size, quality of paper, binding space and the like. If the auditor, or some one to whom this particular responsibility is delegated, determines in advance the exact purposes for which a form is to be used and the number of figures to be entered in each column, he can often cut down the size of his form or adjust it to one of the standard sizes of paper stock. A few square inches of economy in a form of which a hundred thousand sheets are ordered at a time will result in a substantial saving on the annual stationery bill.

If a standard size for ledger sheets is determined in advance, it will facilitate ordering of ledger binders, particularly for stores accounts. It may seem rather difficult to arrive at a standard size, 11x17 in. for example, for all kinds of ledgers, but in instances where all of the information cannot possibly be put on one side of a sheet it is often possible to have the forms printed so that the record will be divided in the center and entries can be made on both sides. If this method is still unsatisfactory, short sheets can be inserted and indefinite expansion provided for. If this is done, the office work need not be delayed (and the office morale lowered) by the use of large and cumbersome ledgers, which are not only expensive, but also very awkward to handle. Another advantage in standard size ledgers will be seen when determining requirements for safe and vault space.

During the past ten or fifteen years substantial improvements have been made in loose-leaf binders and accessory equipment, and it will be found advantageous to make use of these inventions to a considerable extent. Of course, there is a difference of opinion as to the desirability of bound books as compared with loose-leaf records, but to some extent this is a matter of opinion and something for each individual to determine.

Considerable efficiency can also be attained by proper arrangement of columns on the various forms. For example, in the preparation of a voucher record it is very desirable to prepare the form in such a way that the columns for charges to the accounts most generally used are near the "accounts payable" column. This will be quite an item when five or six thousand vouchers have to be posted in a month. It will be advantageous to design other forms with the same idea in view.

It will be found economical to prepare printed forms and ruled paper for as much of the routine work as possible. Computations can often be put in permanent form with almost no additional effort. As an example, it might be said that as simple a process as the distribution of a voucher may be made easier if printed forms are provided for use in listing invoices. There may be instances when a number of invoices, charging different accounts, are vouchered at the same time. A recapitulation of these charges listed on a small form will serve not only to facilitate the preparation of the voucher but also to enable the voucher clerk to charge the proper accounts and the operating expense ledger clerk to make the proper entries.

Forms can often be devised to serve different purposes. The payrolls and material distributions may be entered on the same form, and the same kind of a ledger can be used to control both general ledger and operating expense accounts. A study of this situation will result in substantial economies not only in stationery but also in filing space. With a uniform size for ledgers of 11x17 in. it is no longer necessary to use the old-fashioned, uncomfortable high top desk.

In later installments of this article Mr. Davis will discuss other phases of modern accounting practice.

Claims and Safety

By J. H. HANDLON
Claim Agent Market Street Railway, San Francisco, Cal.

The tremendous increase in number of automobiles and other features of modern street traffic have greatly increased the problems of the claim agent and their complexity. But by safety work, training of employees and other ways, he is doing his best to overcome these handicaps.

THE greatly increased traffic in the streets of our modern cities, even on our suburban highways, has added to the problems of the claims department. Traffic accidents have increased and electric railway claim agents have been compelled to advance their methods to meet these new and trying conditions. Today a modern claim department of a large street railway company is similar to a laboratory where the strength of the warp and woof and dye of a fabric is tested, for every effort is made honestly to determine whether a claim is meritorious or not. Haphazard, hit-and-miss methods have been abandoned.

In former days, before the art of adjusting claims had reached its present state of advancement, it was not unusual for claim agent of a street railway corporation to be accused of practices that would not be countenanced by a modern railway claim agent. Probably the claim agent had been a former detective—many claim agents were—who was influenced by his former environment to such an extent that he was likely to be very critical of all claimants and to consider every claimant his natural enemy. Such a claim agent looked upon an immediate settlement as a "consummation devoutly to be wished," and ordinarily all suggestions of ethics were cast to the winds. Claim agents today are fighting against the evil impressions caused by such practices.

If I should undertake to prepare a creed, a summary of principles for the guidance of street railway claim agents, I would outline it somewhat as follows:

"Let me so do my today's work that my actions will not reflect upon but benefit my employers tomorrow. Therefore, in disposing of yesterday's accident, I must be just and equitable to all concerned. I must use the lesson yesterday's accident taught me to assist in preventing tomorrow's accident, if possible, and failing to dispose of yesterday's accident I must use every resource at my command to gather all of the facts with regard thereto that can be accumulated, so that my employers will be fortified should litigation arise."

The experienced claim agent knows that there is always an opportune time for pressing a settlement, and that time is rarely immediately after the accident occurs, especially in serious personal injury cases. Until a few years ago the Market Street Railway made an immediate appraisal of the damage to all automobiles involved in collisions with their cars. Then we abandoned the practice and found that the proportion of claims for damage to automobiles decreased from 29 per cent to 19 per cent of all such accidents, and the cost to the company was lessened. By adopting such a policy, we relieved ourselves of the annoyance of being compelled to reject claims where we had taken the initiative of sending a company appraiser to call upon the automobile owner.

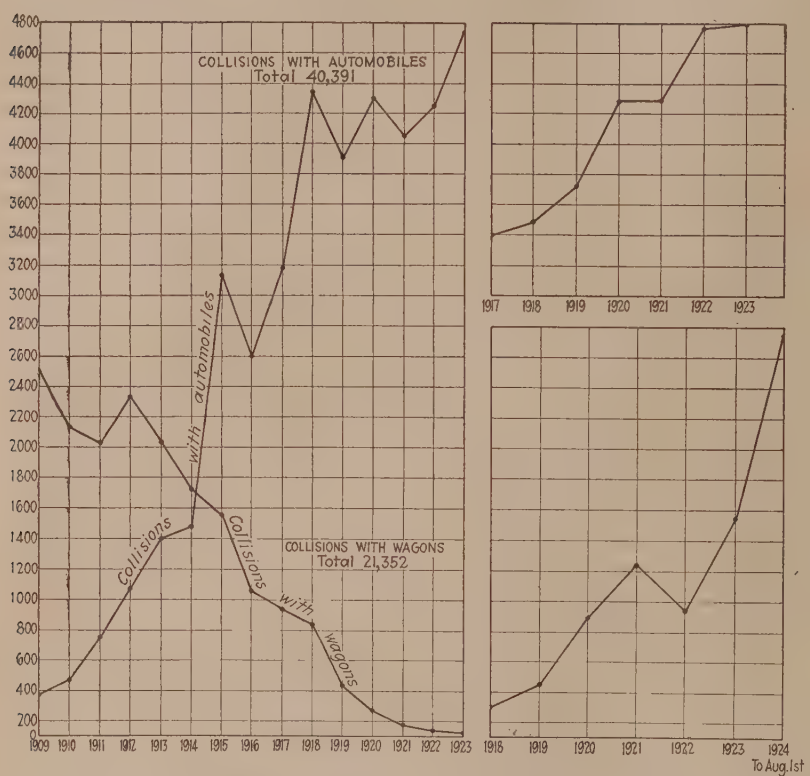
Some of the modern methods now used by claim agents are these: Comparative records are kept on a weekly or monthly basis of all classes of accidents, underlying causes of accidents and their costs. Comparisons are made of accidents by lines or divisions. The individual cost per accident of each platform man is recorded, and a record is maintained of the discipline imposed by each operating official, both in individual accidents and in group form, because operating officials who become lax in enforcing discipline indirectly encourage a "don't care" attitude among the trainmen.

In Each Carhouse a Map Shows the Number and Character of Accidents on Each Route

Occasionally, records are made of the accident costs of employees according to their length of service and the hours when most accidents occur and of the increase or decrease of accidents on lines recently rerouted and where the running time is reduced.

Accidents are investigated regardless of whether a claim is filed, and a close check is made on all un-

reported or "blind" accidents. Monthly contests between divisions are regularly conducted with a view of increasing the number of witnesses per accident, the number of miles traveled per accident, and passengers carried and car-hours operated per accident. Some street railways publish in their "house organ" photographs of motormen and conductors with exceptionally good records as regards freedom from accident; others reward such men with a bonus; others apportion among all trainmen a proportion of all money saved from their "Injuries and Damages" allotment; on other systems prizes are awarded to those whose records are free from accidents.



Accident Statistics of Market Street Railway, San Francisco

At left, chart showing annual number of collisions with wagons and automobiles involving electric cars.

At right, top, increase in automobile claims brought by automobile insurance companies against the Market Street Railway.

At right, bottom, increase in claims collected by the Market Street Railway from automobile owners.

Some Recent Liability Cases

Recently, so far as I am aware, there has been no material change in the law of liability, especially as regards automobiles.

Street railway attorneys on the Pacific Coast, however, are now citing, when defending litigation against their employers, the California Supreme Court decision in the case of the New York Lubricating Oil Company against the United Railroads of San Francisco, 65 Cal., Dec. 427. In its decision the Supreme Court of that state held:

1. Where the driver of an auto truck, although fully aware of the approach of an electric car, closed his eyes to the danger necessarily involved in any attempt to cross the track, and blindly drove his truck into the path of the oncoming car, he was guilty of contributory negligence as a matter of law.

2. It is the duty of automobile truck drivers, approaching an electric railway crossing, to give way to an approaching car, if necessary, to avoid collision.

3. A traveler in approaching a railroad track is not justified in relying upon the assumption that the motorman will not in any way be negligent in the operation of his car, and therefore he is not warranted in believing that the car is being operated at the usual and ordinary rate of speed.

4. As much care is required of a person crossing the tracks of an electric railway upon a private right-of-way in the open country as is required of a person crossing the tracks of a steam railway.

5. It is the duty of a traveler to note the speed at which an electric car is approaching, and if, when he last looks at the approaching car, it is within such a distance and going at such an apparent rate of speed as to cause a reasonable apprehension of danger, it is negligence to attempt to make the crossing.

6. Where the physical facts shown by the undisputed evidence raise the inevitable inference that a person approaching a railroad crossing did not look or listen, or that, having looked and listened, he endeavored to cross immediately in front of a rapidly approaching train which was plainly open to his view, he is as a matter of law guilty of contributory negligence.

7. In an action for damages resulting from a collision on a crossing, if the judgment for the plaintiff can be sustained only on the theory of the doctrine of the last clear chance, it is essential that the court find that the defendant had the last chance to avoid the collision.

8. Where the driver of a truck, which could have been stopped within a distance of 3 ft., was aware of the approach of an electric car going 30 m.p.h. yet closed his eyes to the danger and drove his truck into the path of the oncoming car, and the motorman, while he was yet some distance from the point of collision, was likewise aware of the approach of the truck, it was held that there was no room for the application of the last clear chance doctrine.

9. The doctrine of the last clear chance is only applicable to a defendant who actually perceived the predicament and danger of a plaintiff in time to have avoided the accident by the exercise of due diligence, and defendant cannot be held liable on the theory that he would have discovered the peril of the other but for remissness on his part.

Automobile Legislation Needed

There is crying need of some constructive legislation in the law of liability, so far as automobiles are concerned. For instance, it was at one time held that the negligence of a stage driver was imputable to the passenger upon the theory that they were engaged in a joint enterprise. The courts have since revised their opinion, although in community property states the negligence of either husband or wife is imputable to the other on the theory that the community property will be benefited by a judgment, and this should not be so if it was due to the fault or error of one or the other. While the negligence of the servant is imputable to the master and in some states the negligence of the parent is imputable to the child, the courts are not in accord as to what constitutes a joint enterprise, but they enterprise exists, the negligence of are in unison that wherever a joint

either party is imputed to the others. The question at issue is whether two persons traveling together on the same errand are engaged in a joint enterprise. Some courts say they are and others say they are not.

In cases where the owner of an automobile is concerned, collusion oftentimes exists between that owner and the injured occupant in an endeavor to mulct the insurance company, and under such circumstances the street railway company, if it is involved, sometimes suffers. Legislation should be enacted which would prohibit such recoveries where evidence of conspiracy exists.

The compulsory examination of automobile drivers to eliminate the physically or mentally unfit should be a part of the statutes of every state, and automobile owners should be required to carry liability insurance or provide a bond that will indemnify those they injure. I can foresee the time, and it is not far distant, when automobile insurance companies will classify their risks according to past performances and such hazards as whether the insured is to be the sole driver of the automobile or if the other members of his family are allowed to drive the insured machine, also to what extent the machine is used and where it is used. Insurance premiums will then be paid according to the classification given above, and each owner will strive to reduce his insurance cost by taking more precautions in his driving. This should materially decrease automobile accidents.

In the State of Washington a very satisfactory law is in effect requiring the speed of all automobiles to be reduced to 12 m.p.h. at 50 ft. from all railway crossings.

There is a growing tendency to make the pedestrian assume more responsibility than he has in the past. "Jaywalking" ordinances have been passed and many are under consideration.

If the laws on the statute books were enforced there would be far fewer accidents, but this will not be brought about until those having charge of law enforcement are aroused to the importance of doing their duty. Perhaps, some day, the federal government will seek the cooperation of all of the states in establishing uniform laws throughout the country, and the conscience of the public will also be awakened to a realization of the sanctity of the law and the respect they should show it.

In my opinion, a street railway claim agent should be primarily a good business man and not primarily a lawyer. Preferably, he should be experienced in the operating department of a street railway company so that he may have a keener conception of whether an accident is avoidable. If primarily a lawyer, he is disposed to measure a claim with the same yardstick a jury would use, or has used under like circumstances, where an unreasonably high award has been made—a condition of mind that is expensive to his company. He is also inclined to set up a technical defence, forgetful of the fact that by reason of the peculiar nature of his employment he should not be an advocate but an impartial observer reviewing the facts. Further, in his seclusion, he is likely to construct a theoretical defence which frequently fades away in the light of opposing testimony.

The safety engineer should report directly to the claim agent, for the claim agent is an accident specialist, daily analyzing the causes of accidents, and is in a better position to know immediately where the responsibility for the accident should be placed and to suggest prompt preventives. Besides, the claim agent knows the costs of accidents, and he is vitally interested in reducing them.

Some of the methods of promoting safety employed by electric railways are:

Safety Methods

The formation of safety committees among the employees, the employment of a safety engineer, the installation of safety devices on the street cars and other equipment and the adoption of safety methods of doing work, the putting in effect of arbitrary full stops or check stops for cars or reducing the speed at danger points, using more intelligent and scientific methods of selecting and training platform men and supervising them more closely in their work.

Student Trainmen in the Employ of the Market Street Railway, San Francisco, Being Instructed by the Author of This Article, by Means of Accident Charts, on the Causes of Street Railway Accidents and Methods of Preventing Such Accidents.

The Market Street Railway requires all student trainmen to pass through a probationary period of three months before being finally accepted as full-fledged employees. While they are undergoing an extensive course of training they are instructed by the claim agent on the causes of accidents (more than 30 accident charts being used for that purpose); how to avoid accidents; what to do in the event of accidents; the importance of obtaining witnesses and how to do so, especially those whose position gives them the best view of what has happened; the need of reporting all accidents and

incidents occurring near the car and of not discussing the facts of the accident except with accredited representatives of the company; how to prepare an accident report, etc., etc. Interwoven in these lectures by the claim agent, talks are made by him on what the executive officers of the company expect from the officials having immediate supervision of the trainmen; i.e., that they will be impartial and just in their relations with the platform men, on loyalty and the importance of courtesy.

Each of the thirteen carhouses on the Market Street Railway's system is equipped with maps upon which different colored pins are daily placed showing the various types of accidents occurring on the tracks over which the cars from that carhouse operate. In this manner each trainman is informed of the danger points and what type of accidents he may expect at those danger points, unless he is cautious. It also keeps each trainman acquainted with the number and classes of the accidents that have happened to cars operated from other carhouses on the same trackage.

It is my firm belief that the claims department should co-operate to the fullest extent in the selection and training of trainmen. No radical change in the construction of the Market Street Railway's cars has taken effect since 1908 with the exception that front gates have been installed and the pay-as-you-enter system has been adopted, yet the cars of the company today carry 51 per cent more passengers per accident and travel 53 per cent greater distance per accident than they did in 1908. All this is in spite of the fact that during the intervening period the population of the city has increased at least 37 per cent and automobiles have increased in number from about 5,000 to 85,000.

Since Jan. 1, 1924, the Market Street Railway has presented claims against owners of automobiles who have damaged standing street cars. Previous to the date mentioned, no definite plan was followed by the company of presenting claims of this kind. An accompanying chart shows the claims of this kind collected by the company from Jan. 1, 1924, to Aug. 1, 1924, as compared with the years 1918 to 1924, inclusive. Another chart shows the increase in automobile accidents and decrease in wagon accidents involving cars of the Market Street Railway since 1909. The peak in automobile accidents in 1915 was due to the large number of jitneys and outside automobilists in San Francisco that year because of the Panama Pacific Exposition. A third chart shows the increase in subrogated claims presented by automobile insurance companies against the Market Street Railway from 1917 to 1923.

Public Co-operation

The co-operation of the public in accident prevention is now being sought throughout the country by resorting to such publicity as placing warnings signs on the cars, installing illustrated posters on the car windows, utilizing the backs of transfers, using motion pictures, advertising in the newspapers, lecturing to school children ("the missionaries of the home") that they may acquire safety habits that will prove beneficial while they are juveniles as well as in their adult life; encouraging the formation of safety patrols and safety scouts in the schools, lecturing to clubs and societies, forming branches of the National Safety Council with different branches of the city government participating and enlisting the aid of large employers of labor, sending letters to careless automobilists and employers of automobile drivers such as taxicab, express and draying companies, establishing schools for automobile drivers, passing of ordinances prohibiting "jaywalking," and promoting safety campaigns. These spasmodic, intermittent safety campaigns, while they ordinarily result in an immediate decrease in accidents, do not bring about such beneficial results as continually, everlastingly enforcing, day in and day out, precautionary measures, never relaxing for one moment the efforts to reduce accidents.

There is no doubt as to the tangible monetary returns from safety work, possibly not to the extent its fondest supporters allege, but the "proof of the pudding is in the eating." The experience of the Market Street Railway, which I have cited, has reflected itself in the savings which the company has made in its accident expenditures, although juries are now awarding larger verdicts than heretofore. Juries are influenced in granting exorbitant verdicts against street railway companies by like verdicts rendered against automobile owners, for there is a strong inclination to punish the automobile owner having an accident by hitting his pocketbook or that of his insurance company, or both.

The experience of the Market Street Railway is general throughout the country. With larger jury verdicts and more hazards to contend with in the operation of street cars, most street railway companies are expending proportionally less for their injuries and damage account than they were 10 or 15 years ago.

Some question arises as to whether a street railway should take the active lead nowadays in safety work in a community, and if so should it do so in the open or merely be the motive power behind some civic organization?

Much would seem to depend upon local conditions. If a street railway company is not being made the subject of bitter and unreasonable attacks or severe criticism, and in the minds of the public there exists the thought that the company is making an honest effort to please the public, then it would appear advantageous for the street railway company to take the initiative and itself promote the safety work of a community, not only with a view or reducing accidents but in connection with public welfare work.

Sometimes in communities where there is an active, powerful chamber of commerce or other influential public body greatly interested in civic affairs it would be well to enlist the support of such an organization and allow it to benefit by the publicity derived from public safety work, on the theory that a civic body could accomplish more than the street railway company in securing co-operation from all sources, especially from the newspapers, the police department and the police courts.

In undertaking company safety work and community safety work the fact should always be borne in mind by street railway officials that far greater results can be accomplished through their own organization than by merely obtaining the half-hearted support of the public. The street railway management has immediate and direct control over the actions of its own employees, and on the other hand it cannot regulate the doings of the general public; it can merely suggest what should or should not be done in the interest of safety.

Fire Insurance

By JAMES S. MAHAN
Western Actuarial Bureau, Chicago

An outline is given of seven ways of securing lower insurance rates by reducing the fire risk. Practical suggestions on "Good Housekeeping" and other helps toward fire protection are presented.

HOW to reduce insurance premiums is a question which every street railway official has asked himself many times in the course of the past few years. The answer is that only by a consistent reduction of losses may a general reduction in insurance premiums be enjoyed.

The contributing features to a reduction in fire insurance premiums are:

1. Better building construction.
2. Better electrical construction.
3. Improved housekeeping practices.
4. Reduction or segregation of hazards by the use of standard cut-offs.
5. The installation of approved fire-fighting appliances in the required quantities.
6. The institution of a proper system of supervision during inoperative periods.
7. A detailed study of the special features connected with individual conditions, and closer co-operation between the public service company officials and the fire prevention engineers of the insurance companies.

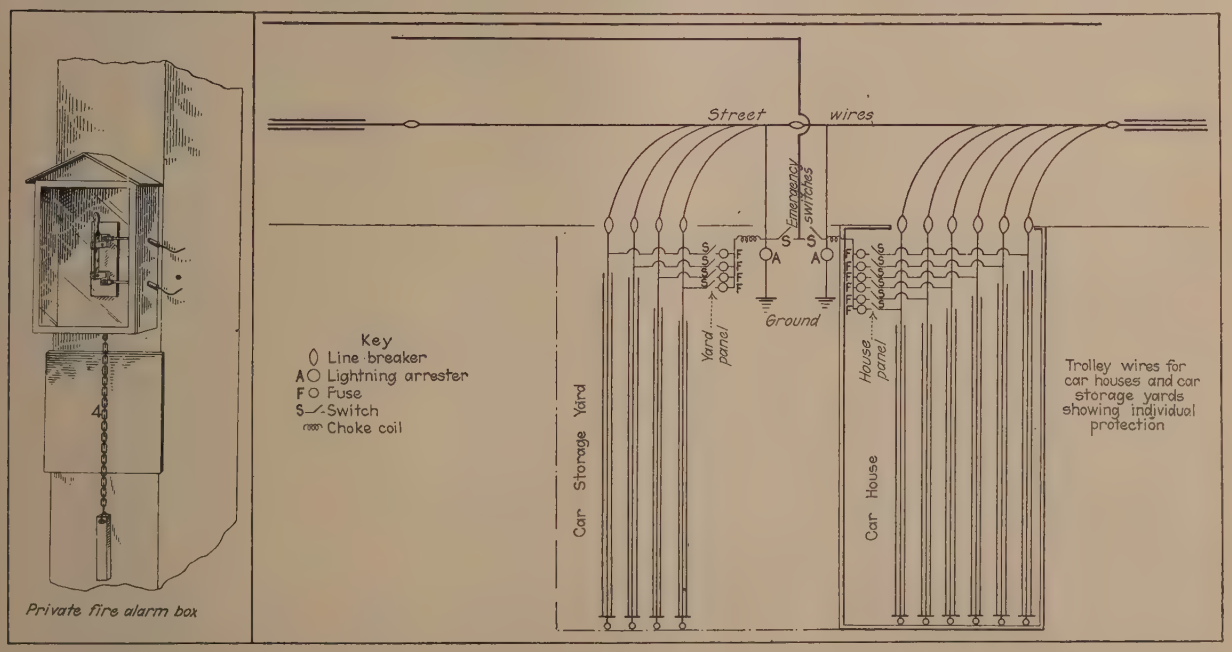
These matters will be treated more fully later.

After determining the general method of reducing insurance premiums, the extent of modern coverage for street railway properties must be considered.

This question resolves itself into a list of the classes of insurance which should be carried by the street railway company to protect properly its operating funds and capital and reserve accounts. The wide range of coverage is shown by the following 18 forms which are the most common: (1) Fire, (2) tornado, (3) common carrier (merchandise in transit), (4) public liability, (5) workmen's compensation, (6) overlapping liability (cars on foreign properties), (7) use and occupancy, (8) riot and commotion, (9) electrical breakdown, (10) flywheel, (11) boiler, (12) car trust (trip) transportation, (13) rent and leasehold, (14) plate glass, (15) bond surety, (16) burglary, (17) life (against death of chief operating officials), (18) group life insurance.

Many of the above forms of coverage overlap considerably.

Reduced rate contribution clauses, commonly called co-insurance classes, should apply to all standard fire policies. The most commonly used of the above clauses are the 80 per cent co-insurance on buildings and



At Left, Alarm Station Switch of the Positive Knife Type. At Right, Individual Protection for Trolley Wires in Carhouses and Car Storage Yards

contents other than rolling stock and the 100 per cent co-insurance clause on all rolling stock. In the latest clauses approved for insertion in "Fire" and "Use and Occupancy" policies, considerable increased coverage is gained.

Blanket coverage on cars is desirable at all times. Fire insurance never should be limited to cars on tracks within a specified division of a system. Individual coverage should be used only when it is necessary to cover a particular car or group of cars in order to comply with some car trust agreement.

Requirements in the Modern Carhouse and Shop

In a new carhouse the following features should be included, in order to secure the most favorable fire insurance rate:

The latest standards of construction, both building and electrical, should be adopted as included in the National Board of Fire Underwriters' requirements covering electric railway carhouses and cars.

The purchase of labeled appliances only should be the rule for equipment such as fire doors, clothes lockers, fire hose, waste cans, safety gasoline cans, oil and paint handling tanks, conduit and other electrical fittings, sand pails, chemical extinguishers and watch-clock equipment.

The purchasing department may render valuable assistance in this matter by purchasing only listed and labeled materials. The savings in insurance premiums will easily offset the small extra cost above that of the unlabeled products. The best guides for the purchasing department in this connection are the two pamphlets issued by the Underwriters' Laboratories, Inc., 207 East Ohio Street, Chicago. These are known as the "List of Inspected Electrical Appliances" and the "Supplement to the List of Inspected Mechanical Appliances."

A track arrangement should be adopted which will permit the ready removal of cars from both ends of the carhouse and at the same time permit the uninterrupted work of the fire fighters. Operating, storage and inspection carhouses should have all tracks run to the street or to a main track, well away from the buildings. Shop buildings, when it is desired to move out-of-service cars from one to the other by means of a transfer table, should be built back to back with the transfer table operating in between, and all tracks should connect to the outside on ends away from the transfer table. There should be no switches or crossovers inside the buildings in either case.

Proper provisions should be made for a private fire alarm, with the proper arrangement of inside standpipes, hose, outside hydrants, and other fire-fighting apparatus, including approved watchman service, either of the central station or portable clock type. Provision should be made for the handling of hose without obstructing the removal of cars.

Suitable arrangements should be made to separate the various special hazards which exist around a car shop. The carpenter, blacksmith, paint, armature and machine shops, as well as the smaller serious hazards, should be in separate fire sections. The division walls should be standard fire walls, parapeted 36 in. above the roof. All openings in walls between sections should be protected by approved, double, automatic fire doors. Oil and paint storage should be in a separate, detached building or in a separate, fireproof section, with all openings into the main building protected by approved automatic fire doors. The door sill should be built up at least 6 in. above the floor level, and a suitable vent and drain to the outside should be provided.

Fire sections should not be more than 20,000 sq.ft. in area and should not inclose more than four tracks. Fire sections of reasonable area mean fewer cars destroyed.

In an old carhouse, it may be impracticable to conform to the National Board of Fire Underwriters' standards, as far as building construction and track layout is concerned, but there should be no trouble in the gradual realization of all of the other requirements for a new carhouse. As a general rule, older buildings require closer supervision and more intensive housekeeping activities. On many systems, the replacement of non-standard equipment and worn-out apparatus has been undertaken upon a progressive program, extending over several years, with the saving in insurance premium paying a big dividend upon the amount invested.

A comprehensive program of fire and safety inspection (they go hand in hand) should be undertaken on every system, the extent of the program, of course, depending upon the size of the operating company. In many cases the saving in safety developments is a very profitable byproduct of the fire prevention activities.

The management should appoint some one man in the official personnel to have charge of this work. In the large organizations, this man can profitably spend his entire time looking after safety, accident compensation and fire insurance features and, to some extent, welfare work. In the smaller organizations, this work will require only part of the designated man's time.

Where the self-inspection system is used, the man in charge of the work should designate some representative at each location to make weekly inspections and report promptly on a printed form furnished for the purpose. These individual risk reports should be examined carefully when received and then filed for ready reference. The chief fire prevention inspector should make at least monthly inspection trips over the property and report on the conditions at each location, and this report should also be filed for further reference.

In order to locate readily any defective or missing equipment, a number should be assigned to each fire pail, chemical extinguisher, waste can and other movable equipment, and a corresponding number, together with an outline of the device, should be painted in a conspicuous color on the wall or post where it is supposed to be. All lockers, fire doors, trolley and "No Smoking" signs, inside standpipes, outside private hydrants, sprinkler valves and watchman stations should also have numbers. With the equipment thus numbered, it is easy for the weekly and monthly inspectors to check each item in the equipment and see that it is in place and in good operating condition. A blank form convenient for the chief fire prevention inspector is published in the accompanying panel.

Watchman and Fire Drill

Watchman service at night is an essential part of the private protection required by property of the kind under consideration. The watchman should be alert and able-bodied and should be instructed as

to his duties and examined at regular intervals to determine his mental and physical fitness to carry them out. In cases of emergency, he may have to act with speed and judgment.

When watchmen clock systems, either the portable clock or central station method of recording rounds, are installed, a system approved by the National Board of Fire Underwriters should be selected to insure proper recognition from the insurance companies in the fire insurance rate. The watchman stations should be well distributed around the premises so that all parts will have proper supervision by the watchman when making his rounds.

One of the best precautions against a disastrous fire loss is a well-drilled private fire brigade. The time to extinguish a fire is in the first minute of its existence. This can best be accomplished in a property where every employee is trained for just such emergencies. Fire drills and practice by private fire brigades have been severely ridiculed, but let it be said in their behalf that a well-organized and properly-drilled private fire department will pay for the time lost in weekly drills many times over in the course of a year.

To assist in establishing and instructing a private brigade the principal features will be outlined briefly:

The private alarm system should be laid out and stations located to cover the entire premises, including both buildings and yard, with the stations registering upon a suitable indicating device. This may be the usual annunciator gong, with key diagram showing station location, or it may be a more elaborate device in the form of a diagram of the premises with the fire alarm station indicated by a red globe which will automatically light when the corresponding alarm switch is closed. The latter system provides an unmistakable guide to the location of the trouble. This indicator, as well as the annunciator type, should be provided with a gong.

The alarm station switches should be of push-button or of positive knife-switch type, as illustrated, the latter being preferable. A suitable weight to insure the prompt breaking of the protecting glass should be chained or wired near the alarm switch box.

Every man should be instructed and drilled in just what is expected of him when that alarm sounds.

Monthly Detailed Inspection by Special Company Fire Prevention Inspector

Company .....

Building .....

Date Inspected ..... *by* ..... *Approved* .....

Oily Waste, Rubbish and Sweeping Cans
1. In standard can?.....
2. Can emptied daily?.....
3. Defective can?.....
4. Standard cans needed?.....

Lockers
1. Clean inside and on top?.....
2. Clothing hung in lockers?.....
3. Made entirely of metal?.....
4. Ventilated?.....
5. Sloping top?.....

Bucket Tanks, Water Pails and Sand Pails
1. Missing?.....
2. Full and in good condition?.....
3. Sand wet, coarse or caked?.....
4. Access obstructed?.....
5. Wooden scoop in sand pails?.....
6. Additional requirements?.....

Chemical and One Quart Extinguishers
1. Missing?.....
2. Full and in good condition?.....
3. Acid bottles properly filled?.....
4. Hose or nozzle missing?.....
5. Access obstructed?.....
6. Additional requirements?.....
7. Does tag on chemical show date of re-charging more than 12 months previous?.....
Are chemical tanks and extinguishers protected from freezing?....

Show Number of Chemical Extinguishers
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Show Number of One Quart Extinguishers
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Fire Trap and Other Doors Are Supposed to Be Kept Closed or Held Open by Fusible Link
1. Operate freely and in good condition?.....
2. Unobstructed?.....
3. Link exposed? .....
4. Link free from paint or corrosion?..

Defects (if any) and Location

.....

.....

Stoves, Forges, Chimneys
1. Set on wood floors or near wood partitions?.....
2. Are ashes removed daily?.....
3. Ashes kept in metal receptacles?...
4. Stove pipe passes through wood partition?.....
5. Chimney brick from foundation through roof (This refers to offices, warehouses and dwellings)?.....

Transformers, Etc.

Are transformers, regulators, and lightning arresters in standard separate fireproof compartments?.....

Paints and Oils

Are fireproof doors to oil rooms kept in operating condition and free from obstruction?.....
Are oil room drains open or obstructed? .....

Matches (Safety Only)
1. Supply kept in metal work?.....
(No matches to be used in garage)

Inside Hose Outfit
1. Connected to supply pipe?.....
2. Hose defective?.....
3. Hose properly racked?.....
4. Nozzle missing?.....
5. Spanners missing?.....
6. Access obstructed?.....
7. Additional requirements?.....

Gasoline
1. Is daily supply kept in approved safety cans?.....
2. Is main suppley kept outside of risk?.....
3. Are blow torches, when not in use, kept outside of buildings?.....
Metal polishes and other liquids of combustible natures to be treated the same as gasoline.

Automatic Sprinkler Equipment
1. Tanks full?....Tank frozen?.....
2. Tell tale in order?.....
3. Tank in good condition?.....
4. Pipes in good condition?.....
5. Check valve buried in proper pits?..
6. Post indicator valves turn easily?
7. Post indicator valve window glasses in good condition?.....
8. Gate valves properly installed and properly working?.....
9. Valves sealed?.....
10. All gate valves open?.....
11. Systems dry?..... Wet?.....
12. Dry systems operating wet?.....
13. Air systems in good condition?...
14. Air pressure maintained at..... pounds.
15. Water pressure.....pounds
16. Alarm valves in good condition?..
17. Alarm circuits, battery in condition?.....
18. Annunciator in condition?.....
19. Sprinkler piping hangers loose?...
20. Heads corroded?.....
21. Any storage above sprinkler head level? .....
22. Sections not equipped?.....
23. All valve keys and wrenches readily accessible?.....

Miscellaneous
1. Are all lamp shades of non-combustible material? .....
2. Are portable electric lamps equipped with wood handles and wire guards?.....
3. Are there two chemical fire extinguishers or 5 pails for every 2,000 sq.ft. of floor space in carhouses? .....
4. Is there one extinguisher for every 2,500 sq.ft. of floor in every substation, power-plant or garage?...
5. Is property within 300 ft. of at least one city fire hydrant?.....
6. Are gas heating devices rigidly connected? .....
7. Are cards conspicuously placed, indicating location of nearest fire alarm box? .....
8. Are "No smoking" signs displayed and the rule observed?.....
9. Is a lantern, equipped for emergency service, readily accessible? .....(Except in gas plant)
10. Are wooden box cuspidors used, or any receptacle for this purpose containing sawdust? .....
11. Is watchman service standard and records properly filled and dated? .....
12. Is wiring in accordance with the National Code? .....
13. Are trolley poles kept pulled down from contact with trolley wires while cars are in barn?.....
14. Are all car aisles kept free from storage? .....
15. Are open flame oil torches and lanterns used in carhouse?.....

In carhouses and shops, the foreman or some other person in authority should be chief of the department, and, as soon as he has had an opportunity to visualize the cause for the alarm, he should send a particularly designated and coached man to turn in the city fire alarm and wait at the alarm box to direct the city fire department to the location of the fire.

All men capable of operating cars should board those present, while certain car cleaners and other such employees should place the current collectors in contact with the current supply. Still others should have the track doors open by this time so that all serviceable cars can be started toward the outside.

Every man not instructed to move or assist in moving cars should be trained to attend some particular piece of fire-fighting apparatus. Answering each alarm should be men with sand and water pails and 2½-gal. acid soda or foam-type and carbon tetrachloride-type fire extinguishers, as well as men with hose connected to inside standpipes and outside hydrants. At each hose connection, a designated man should be in position to turn on the water at the word from the chief.

"Good Housekeeping" Desirable

The influence of housekeeping on the insurance rate is marked. Although the initial installation may have been standard in every way, improper maintenance may prevent the railway from receiving full credit for its expenditure or may be the reason for a heavy "after charge" on the net estimate. Some of the more common housekeeping items are listed below. Bad habits when once contracted upon a property tend to become epidemic. They should promptly be corrected in each instance.

Every effort should be made to prevent the accumulation of trash about the property, particularly in corners—one of the principal hiding places of trash and old rags. Such refuse should be put in approved, self-closing, metal trash containers, and these receptacles should be emptied daily.

The use of rags or sawdust to absorb surplus or leakage oil and grease is a bad practice. It forms an ideal condition for spontaneous combustion.

The much discussed practice of smoking is another feature which carries a heavy penalty in the insurance rate. Smoking should be prohibited except in the men's room and club room. "No Smoking" signs should be posted in conspicuous places, and the rule should be rigidly enforced. This should apply especially to the higher officials of the company, who are frequent offenders in this line. Officials should not ask employees to observe a rule which they ignore.

Trolley poles or other current collectors should not be left in contact with the current supply when cars are not in use. A car which is electrically dead is much less liable to catch fire than one left continually in electrical connection. Signs to the effect that "Trolley poles must be pulled down from contact with trolley wires" will help enforce this rule.

Storage in the car aisles is a bad practice, as it is a decided hindrance to the proper and prompt action of the fire department. The aisles should be kept clear at all times.

The car pits and the space under the floor between pits should be kept free from combustible storage. A fire in this location is both stubborn and hard to reach.

Oily clothes strewn around the premises and the use of wooden lockers for clothing draw a heavy penalty. All discarded clothing should be destroyed, and an approved ventilated locker of the two compartment type should be provided for each man's clothing. This allows one compartment for the employee's working clothing and one for his street clothing, so that there is no good excuse for clothing being left out of the locker.

The placing of storage articles against fire doors or other obstructions to their operation practically destroy their usefulness for the purpose for which they were installed. The track on which these fire doors run should always be kept clean, the rollers well oiled and the automatic attachments in position. A standard fire-door installation is a good safeguard against the spread of fire.

Obstructions to ready access to fire pails, chemical extinguishers and standpipes may cause just enough delay in the prompt extinguishing of a fire to permit it to get beyond control. A clear aisle should be provided to all fire-fighting equipment. Storage should not be allowed to accumulate around sprinkler valve houses or pits.

An out-of-service piece of fire-fighting apparatus is worse than none at all. The fire pails and the tetrachloride extinguishers should be kept full at all times. All 2½-gal. acid soda and foam-type extinguishers should be recharged at least annually and the date of the last charging should appear upon a linen tag attached to the extinguisher. These extinguishers must be well protected from freezing at all times.

Poorly racked hose or hose containing water is a decided hindrance to its prompt handling and also adds to its deterioration. Care should be taken that all hose is thoroughly dried and racked properly on an acceptable reel. In most instances a small petcock in the under side of the standpipe just ahead of the hose connection will clean the pipe of any seepage or condensation and add many months to the life of the hose.

Sprinkler valve houses should be used for no other purpose and should be free from storage at all times. Likewise, sprinkler piping should be free from all obstructions.

The handling of gasoline inside buildings is a dangerous practice, and gasoline should never be used in open receptacles or in ordinary cans. It is better to provide a standard safety can for the working supply and to keep all other supply in a detached oil house.

Carhouse or Open Storage

Undoubtedly it is better from a fire insurance standpoint to use open storage than to store cars inside of a building. Where outside storage is used, the tracks should be divided in groups of not more than 3,000 sq.ft., separated by 12-in. brick firewalls extending 36 in. above roofs of the cars or else by clear spaces of at least 40 ft. These outside storage yards should be equipped with standard hydrants sufficient in number to permit every part of the yard to be easily reached with 100 ft. of hose attached to each.

Competent engineers representing both the electric railway industry and the fire insurance interests have been working together diligently for the past year in an endeavor to arrive at a workable standard for the construction and equipment of

carhouses and cars. Lack of space prohibits the reproduction of the entire report here, although tentative copies may be secured by application to the National Fire Protection Association, 40 Central Street, Boston, Mass.

The engineers working on this subject have collected data from many sources in an endeavor to meet all conditions, as far as it is possible to do so in a standard. In combining the numerous ideas, they have made some radical departures from past practice, looking toward the needs of the present-day electric railway official in his efforts to modernize his equipment and his premises. A few of the most radical departures will be set forth in order that the industry may visualize the savings which may be achieved by their adoption.

Conduit for Car Wiring

For many years there has been an attitude of passive opposition to the use of rigid metal conduit for car wiring. Therefore, the new standards permit three types of construction, in the hope that the manufacturers will develop a product which will meet the new requirements and pass the test of the Underwriters' Laboratories. As far as is known, no such product is now on the market, although the writer is advised that several manufacturers have anticipated a demand for these materials and have already made good progress toward quantity production. The new rules permit wires and cables to be run in any one of the following ways:

1. In rigid metal conduits or cable boxes.
2. In approved flameproof and waterproof non-metallic ducts.
3. With approved rubber insulation, protected by an approved flameproof and waterproof outer covering.

All wires except those run in rigid metal conduit or cable boxes must be so concealed or isolated that unauthorized persons cannot come in contact with them.

Standard rubber-covered wires for lighting or signal circuits may be run in wooden or metal raceways, constructed in accordance with the requirements of the National Electric Code. Such raceways must be accessible but not on the exterior of car bodies or where exposed to moisture.

Approved flameproof and waterproof non-metallic ducts or approved flameproof and waterproof non-metallic outer covering for wires or cables must be so constructed as to resist mechanical injury and must run all the way into the inclosing cases of terminal devices without a break, as is required for conduits.

All metallic parts, such as conduit, apparatus cases, etc., which might possibly become charged, when so located that unauthorized persons may come in contact with them must be permanently and effectively grounded. Apparatus such as air compressor motors, etc., having insulated non-grounded mountings, must be located on the exterior of the car body where passengers are not liable to come in contact with it.

Headlight frames must not be used as conductors, and portable headlights must be wired for double plug connections. All plug connections must be so wired that the female end will be attached to the source of energy.

Heater Installations

All fuel-burning heating devices located inside of the car must be well grounded. One of the most productive sources of car fires is the car heater, the safe installation of which depends upon the addition of certain thicknesses of fire-resisting, insulating materials or a certain air space between the heater case and combustible mounting surface. It is frequently impossible to maintain these spaces or the fire-resisting insulating material is not handy and the mechanic, rather than provide the necessary safety precautions at some trouble to himself, mounts the heater "as is." The natural outcome, sooner or later, is a rolling stock fire. If this occurs when the car is out on the line, the damage may be confined to one car, but if the car is in the carhouse, the odds are greatly in favor of the loss of many cars and possibly of the entire premises. In an endeavor to overcome this trouble the following standard has been established by the committee:

> Heaters shall be constructed in such a manner with regard to their heating elements and inclosing cases that they may be mounted on combustible portions of car body without danger of exceeding safe temperature limits of any combustible portions of cars. Metal inclosing cases shall be effectively grounded.

Later on in the report, a series of recommendations were made, at the request of a few members of the A.E.R.A., in an endeavor to make it still possible to use the old type heaters by the employment of various accessory materials. A little thought on this matter will convince every operating official that with the addition of each accessory material the installation and replacement cost will be considerably increased.

One manufacturer has already developed a complete set of heaters, with spacings and protection in the heater case itself, making the only necessary mounting accessories four bolts or screws, so that it may be repaired while in its permanent position in the car. Certainly this is modernization as regards heater construction and installation.

Carhouse Tracks

A large percentage of the heavy losses from carhouse fires may be traced directly to the inability of the man on duty at the time of the fire to move the cars from the building. There are two principal contributing features to this non-movement. One is the poor arrangement of the tracks, which has been covered elsewhere. A possibly more important feature contributing to the non-movement of cars is the failure of the current supply.

After due consideration, a system of protection for the power supply to cars has been designed which calls for a separate switch and fuse or an automatic circuit breaker to be installed in a separate feeder to the supply conductor for each track. With this arrangement, a short circuit due to a fire on one track will not operate the main circuit breaker at the power station, but instead, will deaden only the supply conductor for the particular track in question and will still permit the ready removal of cars on all other tracks. Such a layout is shown in the illustration on page 523.

No attempt will be made to answer the question for any individual company as to whether this type of construction will be adapted to its particular system. The claim is made that it is modern construction. Its use will permit the removal of cars, and the fewer the cars destroyed by fire, the smaller will be the fire insurance loss ratio. The loss ratio for the whole industry is what governs the basic insurance rate.

Ride Salesmanship

By WALTER JACKSON
Fare and Bus Consultant, Mount Vernon, N. Y.

While many advances occur in material things such as track, power and cars, human nature as expressed in salesmanship is not affected by time, but by competition or the need to avert financial disaster.

"For almost all things have already been found out, but some have been neglected and others which have been known have not been put in practice."—*Aristotle's "Politics," Book II, Chapter V, Ellis' translation.*

IF THIS article is an exception to the keyword of this issue, "Modernization," the reason is that it does not deal with material things that unquestionably do improve with the years, but rather with one particular aspect of human nature—that "human nature" which most philosophers assure us has not changed sensibly for the better since the first *pithecanthrope* decided to stand on his hind legs only. This particular aspect of human nature is that we tend to be patient, pleasant and persistent when we have to compete for favor, and indifferent, discourteous and tyrannical when the spur of rivalry is absent.

The Insull-Budds only prove the rule.

No discussion of how the railway can sell its product must ignore the fact that this industry began with competitive conditions that made for salesmanship, continued through a generation of monopoly that stifled salesmanship and finally emerged into a situation where it is realized that the old ride-selling spirit must be recaptured and heightened.

What! Are we to go back to horse car days to learn how to convert our industry into a business? Why not? Surely "there were giants before the flood"; nor did all the wisdom of the world begin with the twentieth century.

Equipment changes, but the meaning of salesmanship is ever the same.

"When I was a little, tiny boy" there were few transport monopolies. Often two rival roads paralleled each other for miles with but a block or two between them. How they vied with one another to draw trade! It is true that they could not offer a tithe of the actual comforts which their monopolistic successors gave because of technical advances. But everything is relative. People don't grumble for conveniences they never heard of, but they do get angry about the omission of any good things they have become used to.

Lineman, Spare that Tree, Touch Not a Single Bough

As a child in its innocence of greater values is "pleased with a rattle, tickled with a straw," so did our parents appreciate the blues, reds and yellows of the car bodies, the liberal display of gold leaf, scrollwork and beading, the Brussels carpet on the seats and the floor straw "of the better kind."

In those days, also, rides were sold on what was roughly a distance basis. A separate fare had to be paid on each of the separately owned routes. Nor were the fares uniform on even the same system, for evidence of which we have the following jingle made famous by Mark Twain:

Conductor, when you receive a fare
Punch in the presence of the passenjare.
A blue trip slip for an 8-cent fare,
A buff trip slip for a 6-cent fare,
A pink trip slip for a 3-cent fare,
Punch in the presence of the passenjare.
Punch, brothers! Punch with care!
Punch in the presence of the passenjare.

The selling spirit lived on into the earlier days of electrification when free or sample rides were offered to offset the fear of electrocution.

That isn't all. In still earlier days, when people were afraid to use the steam railroad, there had been such pleasing commutation plans as season tickets which called for no limitation of rides, no tearing out of coupons and no punching of cards. So it was not altogether a shock when an old gentleman on hearing of the weekly pass trebled: "Why, we had something like that in Toonerville sixty years ago."

So far as salesmanship goes, Rabbi Ben Akiba was right in asserting: "There is nothing new under the sun." But this should not discourage us. Old thoughts reminted may prove current coin.

Even the Engineer Must Consider Sales Aspects

In discussing the sale of the ride, fares and headways are of chief concern. But it is not well to put all the responsibility on the operating personnel. A sales viewpoint on the part of the engineering forces is also essential. For example:

Should trackless trolley or gasoline bus be adopted for a given situation? Pure engineering considerations may point to trackless because "it's the good old trolley on tires and juice is cheaper than gas." Temper this by the viewpoint of the citizens affected, and it may prove that the prospective patrons are so eager to keep their tree-line undefiled that they would rather pay a higher fare

on the bus. In one instance where the trackless was installed over the protests of the residents, the saving in cost of operation over gasoline far from offset the factors of better public relations and greater earning power possible with a gasoline bus. You can't treat a factory district and a residence street alike.

In other departments, the sales viewpoint has a less obvious effect on good business, but it is there just the same. In far-off Hamburg the municipal power station is one of the show places of the city. How many of our power plants are built with no regard whatever to impressing the public with the monumental importance of the structure that is truly the heart-pump of the community in the circulation of its citizens. Instead of acquiring a feeling of respect, the public can't help having a feeling of contempt for the drab brick structure and its owners—when it finds out who the owners are. Yet any despairing architect will tell you how little difference there is in cost between a handsome building and an ugly one.

If coal piles and railroad sidings make beauty, and publicity therefor impossible, what is wrong with our substations? We have plenty of good-looking "subs," but how many of them carry anything but an obscure monogram—if that little? If you have put up the handsomest building in the neighborhood, don't hesitate to brag a bit about its owners, its purpose and its usefulness.

Good Housekeeping Is Also Good Salesmanship

While ownership of power plants and substations may remain a mystery to the many, everybody can identify those responsible for the looks of carhouses and shops. These are commonly located along some trunk highway. Their appearance impresses many thousands of persons, favorably or otherwise. Here are two examples of the layouts that make a favorable impression:

In one of our large cities half a dozen routes run by the carhouse. It is a busy place, but not too busy to have a lawn and garden spots that elicit many a compliment from the rider-by. In a second, much smaller city every automobile entering from the west must roll by the railway headquarters. Here the lawn is used to excellent advantage for snappy artistic pictures and sayings so that even he who rides rapidly may read the railway story.

Contrast this with the car-house which exposed to public view a lot of rusty sprinkler piping and pits filled almost to the brim with the junk of bygone years. Would any citizen

Whose and What for—Mausoleum, Residence, Library or Sub?

familiar with such a sight appreciate the demand for a higher fare?

Only a fraction of the population may see the company's structures, but everybody sees its cars, although not everybody nowadays will ride in them. One reason that they won't is just a matter of plain cleanliness. Outside of their monopoly of the de luxe highways, there is nothing particularly de luxe about double-deck buses on solid tires. Then why do the bus operators get a higher fare and prosper? Some of the reasons are bad ones and some are good. Among the good reasons is the almost meticulous care given to the

Cleanliness Is Next to Godliness and Pays, Too

spruceness of the buses and the men who run them—not always at the high trolley wages either.

The trolley car, unstinted as to light and heat and free from noxious gases, should be ashamed to let the bus get ahead of it in drawing power on the score of cleanliness or general appearance. How many electric railways are following the example of the common-sense manager who has housewives ride his cars to report if the car standard of cleanliness is up to theirs? A car isn't a home, but it's astonishing how these reports, a day's vacation, a $5 bill and public commendation can give to the platform men a hausfrau's interest in the nattiness of their cars.

Apropos of this, a manager tells the following story: Uncle Tom was a good and faithful operator, but the invention of a whole flock of safety razors had meant nothing in his long life. The only modern invention of interest to him was the use of celluloid in place of linen. No use talking to Tom about sartorial advancement. Came a day, as the pictures say, when Uncle Tom's shuttle car, which had been the derision of the town, was at last replaced with a shiny safety. A few days later, with no suggestion from any one, there was a transformed "Traction Tom." No baggy coat and trousers, no loose buttons, no unmowed facial lawn, but a Tom brighter and cheerier than ever. "Like cars, like men." Was the joke on Tom or on his boss?

Make Your Cars Compel Favorable Attention

Of course, not the cleanest trolley in the world can draw as much attention as an ordinary bus does at the present time. Why is that? Novelty. How can we restore the trolley to the plane where it will get a second look? Give it novelty. A hair bob can turn an old wife into a new one. Paint will do the same trick for wives and cars.

"In the dear dead days beyond recall" the value of car painting and general ornamentation for sales reasons was far better understood than now. Memories of childhood days include pictures of noble red men smoking peace pipes at charming brooksides painted on the sides of the cars, entrancing scrolls of gold leaf, fine carvings and beadings, bronze or brass fitments and the spectrum's own variety of colored panes in monitor and bulkhead sash.

To what a low estate we fell when grim materialism swept all these charms away. Instead of compelling cleanliness by using bright colors that would show the dirt, we went to dreary shades that promised to hide it. Luckily the "safety first" movement came along and with it a return

to brighter colors for the sake of high visibility.

Let us go a step further than color for safety's sake. Another suit of clothes makes even our closest associates take notice. Why stick to the same car colors indefinitely if a was in that fix too, and couldn't afford to paint his cars, but who scraped together enough pennies to tint his dashers a lively orange? There's hope for him, just as there proved to be for the hustler who bathroom-enameled the interiors of

Panel from the Horse-Traction School of Art, Circa 1880

change from yellow to red, from red to blue, from blue to gold, and so on, will shock the public into realizing that we are alive? This doesn't mean scraping down to the bottom every year or so, but simply a pleasing rotation as the cars come through the shops for body color. It hasn't hurt Glasgow to have a different color combination on every route, although identification by passengers and not desire for diversity caused this practice.

In dropping pictures and lettering as well as color, the efficiency innovators went so far as to drop the name or special insignia of the railway. Isn't there something to learn here from those British municipal tramways whose cars carry the civic coat-of-arms? Or from the Southern manager who painted his cars a rich blue and gold in honor of the local university? Or more recently, from the Northern property where the latest cars are identifiable through a wondrous and much-talked of sunburst or spider-web on the dash?

Here one seems to hear an anguished cry about sacrilege toward the god "Standardization," America's own private fetish. Standardization of bolts and nuts, of motors and brakes, of controllers and sash—yes. Standardization of appearance to the point of repulsion—no. Of what profit to save a little money in the paint shop and lose a horde of fares? The death of Egyptian and the stagnation of Chinese civilization were caused largely by a slavish adherence to standards; in another word, tradition.

But perhaps there is the more reasonable protest: "We haven't the money." How about the chap who old cars while waiting for new ones. It is just these evidences of sales ingenuity that inspire the granting of credit.

So much could be written about other sales aspects of the car that one hesitates to begin. Let us say a word or two about the hoary question of seats.

That Brussels-covered longitudinal seat in the slow-moving horse car was a real luxury compared with the cane and slat seats that our parents used in their living rooms, for the stuffed horsehair furniture was used only for state occasions. In these days of deep leather library suites

Pass On, Me for the Car Behind

and millions of automobile cushions the slat seat of the street car suggests that not all electric railways appreciate the changes going on in the world about them. Worse yet—cars are still coming out with longitudinal seats, where there is no real need for them. It's the voluntary, off-peak rider who brings the profits. Alternate longitudinal and cross-seat cars on a route, as one railway did, and see how often the prospect prefers to let the less comfortable car go by. There is some reverse English in the remark of the lady who said: "I wait for the side-seat cars because I can always be sure of a seat in them."

Heating, lighting and ventilation are old subjects, you say. Granted. But so long as we have so-called "electric" cars spouting noxious smoke over that nice new varnish or soiling the fresh enamel inside, we'd better continue arguing for electric heating with thermostatic control. As for ventilation, there's so much imagination about it that no matter how good your automatic ventilators are, let the passengers see some openings somewhere! Why sacrifice those inimitable advantages of the electric car, viz., abundant light, clean warmth and uncontaminated air? Play them up. They are part of your stock in trade.

As to signs, we have improved a great deal over the miserable tin and block signs of a decade or two ago and similar alleged identifications of the route traversed. Perhaps we will never tell the customer as much as on the long side signs of the old-time horse cars, but how comforting it is to a stranger to know something more about where the car is going than its terminals. And, by the way, you single-enders, do your platform men invariably change the signs when they loop around, so one will know whether the cars are going or coming?

Finally, there is the vexed question of life. The placid Chinese temperament would consider longevity an ideal characteristic of the trolley, but the restless American cries ever for "Change, change, change." Consider the automobile maker. He turned out an "absolutely faultless car" last year, but this year he makes the auto user feel cheap if his "boat" has no balloon tires, four-wheel brakes and one-shot lubrication. So next year there will be a profitable turn-in for Mr. Manufacturer, although the present car may be giving perfect satisfaction. The automotive industry would be in a sad way if it played for longevity.

Yet some railroaders still pipe about durability and brag that their passenger cars are heavy enough to serve as snowplows. The public may laugh at the safeties, but they *ride* 'em.

Let our motto be: "Ten years life, but a busy one."

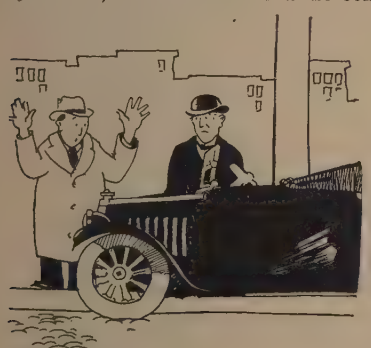
When we had 5-cent fares and universal transfers this gave the

passenger the simplest possible fare system, except that the transfer was a frequent source of irritation. The later odd-fare combinations have added to the work of passenger and platform man and slowed down the interchange of passengers. Under these circumstances, it was the obvious duty of every operator to strive for ticket and token rates that would be used by most of the passengers.

The majority of operators have come to appreciate this fact, but there are still plenty of cases where the purchase of tokens is inconvenient or unprofitable. What shall we say of a combination such as a 7-cent cash fare and four tickets for 26 cents, and these tickets purchasable only at stores where the prospective passenger is naturally expected to buy something else in return for the favor? Then, again, there are cases where tickets are sold fifteen for $1 when the cash fare is 7 cents, and other instances where there is no difference whatever in the cash and token rates.

Companies unwilling to push tickets may argue that with a 7-cent fare they cannot afford to sell tokens at 6¼ cents. One remedy lies in seeking a higher cash fare while retaining the old rate for a token. For example, if the present cash fare is 7 cents, it may be possible to get a cash fare of 10 cents provided tokens are sold at seven for 50 cents or, possibly, as low as four for 25 cents. If the token rate proves too low, there is still the possibility of securing the convenient rate of three for 25 cents. In between is the rate of two for 15 cents as another eventuality.

In short, if the present cash fare is too low to risk an 80 to 90 per cent token ratio, there must be sought a cash fare high enough to produce an attractive gap between the new cash and token rates. One city of 30,000 which had a 10-cent



Man, Man, Don't You Realize That Success Rides in a 1924 Model?

"Pass" the Fare Box and Get the Vacant Seat

cash fare and a four-for-25-cents token produced a 92 per cent ratio of riders on tokens. Under these circumstances, residents always referred to the fare as "four for a quarter." It is plain that any person who would not invest the price of four rides, good any time, had no call to complain very loudly about the 10-cent rate for casuals.

The foregoing is the first step in producing a fare schedule that sells itself to the public on a merchandising basis. It not only serves the customer's convenience and saves his time, but also shows a desire to favor the regular patrons. Still, it must be recognized that while tickets, tokens and punch cards are very helpful, they do not differentiate between regular and semi-regular riders. Such a differentiation can be partly effected by two different token rates, such as three tickets for 25 cents and sixteen tickets for $1.

Better than twofold token rates are the monthly card and weekly pass, both of which come pretty close to assuring the operator that the lowest rate is being enjoyed by the steadiest customer. This is because the concession must be used within the period noted on the card. Under the monthly card plan, the cash fare is usually set at 10 cents. Persons who purchase a card at prices from 50 cents a month upward thereby obtain a warrant which permits them to drop only 5 cents each time they ride. In this way, odd fares are eliminated and change-making reduced to insignificance. Pass riders require no transfers.

In most of the railways using it the weekly pass was added to preexisting cash and token fares. In one case the popularity of the pass with regular riders secured the company permission within three months to raise the casual fare from 6 cents to 7 cents. More recently, the pass has been added simultaneously with an increase in cash to 10 cents, while the old cash fare becomes a token rate or else the previous token rate remains.

Thus, in one case a schedule of 8 cents cash and two tokens for 15 cents has become 10 cents, six tokens for 45 cents and a $1.25 pass; in a second case, the schedule has changed from 7 cents cash and 7 cents token to 10 cents cash, five tokens for 35 cents and a $1.25 pass, and in a third case, from 7 cents cash to 10 cents cash and a $1.25 pass.

With either the monthly card or the weekly pass, with or without intermediate token rates, it becomes easier to secure a truly commercial scale of rates because an increase to casuals is accompanied by a decrease

A Cold Start Is a Bad Introduction

to regulars. Such a course disarms much opposition.

These plans do not pretend to be universally applicable or inevitably profitable. They are simply offered in the hope that if the expense to the rider is lowered in some proportion to his patronage and his ease of using the cars is enhanced the results in revenue and good will may frequently be worth while. Both plans also depend for their success upon the condition that a reasonably large proportion, say 35 per cent, of the rides is taken by people traveling to and from work, and that there are sufficient off-peak attractions in the community to give scope to building up off-peak business. Failure to realize these basic conditions is responsible for a number of miscues with both card and pass.

A factor often overlooked is that any special fare plan can serve as sales leader for the rest of the company's service. The Pittsburgh cross-town transfer is a good example. On Sundays and holidays it

is now possible to get a 16⅔-cent crosstown ride for 10 cents. Although the number of such transfers sold has nearly tripled since their liberalization, the real point is that in advertising this concession the company advertised all its other services by implication. A general advertisement reading "Use the Trolleys to Schenley Park" would have had little vim, but one reading that "You Can Now Reach Schenley Park for a Dime" not only made a direct appeal to the crosstown rider but also left a pleasant aftertaste for those who could reach the park on a regular 8⅓-cent fare.

All of which means that no fare plan is worth a tinker's wiping felt unless it is advertised.

Every Railway Should Have Some Truly Local Advertising

This naturally brings us to the last section of the story—how to put our ride-selling or service-giving endeavors into words. It is taken for granted that what is wanted is words for deeds or thoughts in actual being, since "Words without thoughts never to Heaven go."

No utilities have a better opportunity for setting forth their arguments than the electric railways. Their car exteriors are seen by everybody, and dasher placards or window cards cost much less than the newspaper space which others must use willy-nilly. But it would not do to follow the example of the railway which ran a safety plea on cars equipped with fearsome home-made fenders or to carry "Clean-Up Week" notices on dirty windows!

Economy in some cases and diffidence in writing ability in more cases have led to large use of syndicated publicity. Much of this is excellent, but no one will ever succeed in writing syndicated copy that won't be out of place somewhere. In using such material, the railway must still exercise executive supervision. When a series of syndicated advertisements is put up by the carhouse men as a matter of routine, we get such "bones" as the plea for fair play against jitneys in a community that never knew that pest.

In syndicated publicity there is also lacking that local touch which goes straight home. An advertisement reading "Use the Trolley to the Park" means little; one reading "Take This Car to Snaggle Park" is a definite invitation and one reading "Use this or that special rate transportation for trips to such and such places" is the best of all because it appeals to the bargain instinct.

Most car advertising contracts are sufficiently liberal to permit the railway to carry almost any advertising that definitely promotes travel, and in most instances where some special event is coming along its promoters are willing enough to bear the printing cost for the sake of such excellent free publicity. All that the operator has to do is to overcome his fear of expressing himself in printer's ink. No great genius is needed to tell a straight story in a few words. If given a few examples of style the least-lettered man with the proper enthusiasm will soon learn how to express himself. His grammar may need correction, but his ideas will hit the local fancy more truly than more elaborate efforts by a professional advertisement writer writing for the world at large.

A last word. Have you ever been chilled by the formal "Sir" of a government letter? Then you can guess how your customers feel when they read a stilted or arbitrarily worded announcement of a change in fares or service. Not long ago one of our large companies voluntarily made most important concessions in transfers. The wording was left to a schedule man, who succeeded miraculously well in making the casual readers of the closely printed placard believe that something more was being taken away from them.

L'Envoi

The moral of this is that when we have a long story to tell we should follow the newspaper style of giving the high spot in the headline. How much better it would have been to have headed this statement: "These Free Transfers Begin June 1" instead of the meaningless "Announcement" or "Transfer Changes." Walk through any good department store and copy the wording of directions to customers. Then compare this wording with that on tickets, transfers, car placards, etc. In the former statements courtesy is an invariable note and in the other it seems to occur by accident.

We have all heard of the woman who cried: "Oh, that blessed word, Mes-op-o-tamia!" But thrice blest is "Please." As the master word in the transportation lexicon, it will go just as well with the sale of rides as with the sale of shoes and collars.

American Association News

Convention Announcements

ADMISSION to the events at the convention will be by badge. No one will be admitted to the Pier except by displaying the official badge to the gateman. This applies to the evening events as well as to the technical sessions.

Official programs for the convention were mailed Sept. 25. To insure delivery before the delegates leave home those for far Western members were sent by air mail—another evidence of modernization.

A special attempt will be made this year to have all events start promptly at the hour announced in the program. This is necessary because of the large number of papers, reports and entertainments scheduled. Delegates are urged to co-operate by being on time.

Advance registration this year is far in advance of last year's at the corresponding date. With the exhibit space completely sold out, there is every assurance that this convention will be the biggest ever.

To Make a Trip to the Convention More Valuable

ACTING on the belief that often the member companies of the A.E.R.A. have not realized the greatest possible value from the visits of their representatives to the annual convention, the association is distributing to member executives "convention notes" booklets. These are blank books in which persons attending the convention may make notes at meetings and during their inspection of exhibits. A letter from President Budd, pointing out how railway men can get the greatest benefit from a trip to the convention, accompanies the booklet.

Take Your Golf Clubs

THE golf tournament in connection with the Atlantic City convention will be held from 9 a.m. to 5 p.m, Sunday, Oct. 5.

The golf committee has arranged for a number of prizes well worth competing for. Please send your golf handicap immediately to George A. Barnes, 1700 Liggett Building, New York, N. Y. No matter how good or how poor a player you may be you want to get into this tournament, as there will be a prize for you to shoot at.

Canadians to Meet at Atlantic City

ARRANGEMENTS have been made to hold an informal mid-year meeting of the Canadian Electric Railway Association at Atlantic City during convention week. The meeting will be held on Oct. 7, at the Marlborough-Blenheim, beginning at 10:30 a.m.

The News of the Industry

Trailers Prohibited

New York City Authorities Against Their Use—Skip-Stop Plan Started —Commuters' Habits Charted

The Board of Estimate of New York City, sitting on Sept. 22 in committee of the whole, adopted a resolution prohibiting the street railways in Brooklyn, including those operated by the Brooklyn-Manhattan Transit Corporation, from using "trailers" on trolley cars.

It is the intention of the Board of Estimate to hold a meeting in the near future devoted exclusively to the subject of bus route franchises. This was decided on Sept. 22 on the suggestion of Mayor Hylan, but a date for the hearing was not fixed.

A study of the proposed bus routes will be made by the Merchants Association in conjunction with the Russell Sage Foundation. This was also decided on Sept. 22 at a meeting of the executive committee of the Merchants Association upon recommendation of its committee on city transit, of which Theodore Beran, district manager of the General Electric Company, is chairman.

Although formal action will not be taken until Sept. 29 the Board of Transportation virtually adopted on Sept. 23 the route which it will recommend to the Board of Estimate and Apportionment for the uncompleted portion of the Fourteenth Street-Eastern District subway. That section of the line which until now has remained undetermined extends from Eldert Street and Wyckoff Avenue, Brooklyn, to its connection with the existing Broadway elevated line to East New York.

The skip-stop plan of operation was put into effect on Sept. 21 as a police measure in the interest of greater safety and to speed up traffic. The new arrangement appears to be working satisfactory, but sufficient time has hardly elapsed for the officials charged with the responsibility to carry out the provisions of the order accurately to appraise the accomplishments under it. Patrons of the various companies were told of the change in advance through the public press and by means of placards in the street cars. These placards varied in their wording, but the import of all of them was the same, namely, a plea for co-operation on the part of the rider with the railway officials. The notice posted in the cars of the New York Railways read as follows:

SKIP STOP
ISSUED BY POLICE DEPARTMENT

Commencing at 12.01 a.m., Sunday, Sept. 21, all north and southbound cars will stop only at even numbered streets between 146th Street and Eighth Street, except at railway crossings and points where "car stop" signs are placed to designate special stops.

The company is desirous of co-operating in every way with the authorities and we ask that our patrons help us toward relieving the serious street congestion, thereby speeding up the car in which you are riding by keeping in mind the regulations which the police department has ruled shall be put into effect.

New Jersey commuters have been taking part in the biggest public count ever attempted, outside of a war draft. It is being made by the North Jersey Transit Commission for the purpose of marshalling "flow of travel" information to be used in mass formation in the working out of a plan for the improving of transit service in Hudson County and in the other eight counties of northern New Jersey.

This information is being given by a very simple check-up system, on cards distributed at the entrances to the Tube stations and ferry stations and to the passengers on the steam railways. Each branch of each railroad has its own form of card, with stations printed upon it, so the work of the passengers will be most simple.

The railroads are co-operating, as are also the police and firemen in some sections, and the commission hopes to be in a position to work out a plan that will make possible an efficient solution of the problem that it is declared now makes commuter life none too enjoyable in New Jersey.

A typical card handed to the commuter if checked properly by him will show the facility used by him in getting to the station, the type of steam railroad ticket, the station at which he boards the train and the station at which he leaves, his approximate destination in New York whether east or west of Broadway and how far north or south, and the route used in New York, whether west side subway, east side subway, B-M. T. subway, elevated, surface lines or bus or whether he walks.

Railway at St. Louis Gets First Bus Rights

The Board of Public Service of St. Louis, Mo., on Sept. 16 issued a permit to the St. Louis Bus Company, a subsidiary of the United Railways, to operate a bus line from the terminus of the Natural Bridge car line, Natural Bridge Avenue near Kings Highway, west on Natural Bridge Avenue and Natural Bridge Road to Pine Lawn, St. Louis County. This is the first bus permit granted to the St. Louis Bus Company. Other bus applications by the company are pending.

The proposed line will connect with the Union Boulevard and Kirkwood-Ferguson divisions of the United Railways. It is proposed to charge a 10-cent city fare with transfers to and from the street cars. Street car patrons desiring a bus transfer will pay an extra 3 cents for the privilege. The street car fare is 7 cents.

Ten-Cent Fare in Springfield

Conceding that the Springfield Street Railway, Springfield, Mass., has not been in a desirable financial condition since 1917, the Massachusetts Department of Public Utilities has authorized the company to increase its fare unit to 10 cents. The order providing for a cash fare of 10 cents and three tickets for 25 cents went into effect on Sept. 21. The former cash fare was 7 cents.

Zones have not been changed under the new arrangements, but interzone and intercity ticket strips are sold that enable patrons in many cases to ride at only a small increase over the old rates. This arrangement gives a ride to the Holyoke city line for 12½ cents, as against 11 1/9 cents previously; to Westfield for 20§, as against 17 11/18 previously; to Chicopee for 10 cents, as against 9 1/11 previously, and to Palmer for 45§ cents, as against 39 1/9 previously. The state board says:

Apart from any question of law, we think it obvious that a public utility should be allowed rates which, under reasonably prudent and economical management, will yield a return upon capital employed in the enterprise sufficient to make that capital an attractive investment. Under the laws of the Commonwealth a street railway company is obliged to sell its stock at par or not at all. Thus any policy which results in a failure to maintain the value of its stock at par cripples its ability to meet the growing needs of the community, impairs its credit, and, if long continued, results in financial disaster to the company and great inconvenience to the public. The board further justifies its decision when it says: The passengers desire the service at the lowest cost. This service cannot be given unless the passengers pay that which is necessary to give the service.

Last June a special arbitration board awarded an increase in pay to the company's employees. This increased the expenses by $235,000 a year, and at the same time there was a decrease in riding, due to general business depression. In the opinion of the department the company could not continue its present service without additional revenue, and the department dismisses as a proved fallacy the argument that a reduction of fares would stimulate riding and increase the company's income.

Interurban Advertises Service by Special Car

The Rochester, Lockport & Buffalo Railroad, operating between Rochester and Buffalo, N. Y., has put into service a large car painted black and white on the sides of which are the words, "Ride the Electric Cars and Save the Difference." On the ends of the car is painted, "Ride with Us." The car was designed by W. W. Foster, general manager of the company, as an advertisement. It was built by J. D. Nailor, superintendent and master mechanic. L. L. Lang, trainmaster of the line, is in charge of the car.

Subways to Be Recommended for St. Louis

A rapid transit system for St. Louis to cost upward of $100,000,000 and to provide subways for all street cars entering the downtown business district will be recommended to the St. Louis Board of Aldermen when they reconvene on Sept. 26 after their summer vacation. The special aldermanic committee which recently toured Eastern cities to study transportation methods will present the recommendation. It will provide for the appropriation of $25,000 for an immediate investigation and survey of the rapid transit needs of the city.

In a report prepared by C. E. Smith, the investigating committee recommends that $100,000,000 be raised for a rapid transit system, the first step to be a downtown subway, to be followed as soon as possible with elevated lines into the residential sections and a crosstown subway at Grand Boulevard. This plan will provide that all street car lines in the district bounded by Jefferson Avenue and the river, Chouteau Avenue and Cass Avenue be put underground. It is further suggested that several rapid transit lines be developed for the best interests of the entire community. Alderman Wimer, chairman of the committee, favors the city building the subway and renting it to a private company to operate, preferably the United Railways.

The committee found that elevated railroads are receiving increased consideration in many cities because of their cost compared with subways.

The committee visited New York, Chicago, Philadelphia, Boston and Detroit. It found that Boston and Philadelphia's transportation problems more closely resembled those of St. Louis than the other cities.

Under a provision of the Missouri State Constitution adopted in 1920 St. Louis has ample authority to vote the $100,000.000 in bonds needed to finance the subways and rapid transit system outlined to the Aldermen.

Detroit Commission Members Reappointed to Construct System

All members of the old rapid transit commission in Detroit have been appointed by acting Mayor John C. Lodge to serve on the new commission provided for in the charter amendment approved by the voters at the Sept. 9 election. The new commission will have charge of construction of the rapid transit system and will turn the various sections over to the city for operation upon completion.

In order to pave the way for following out the mandate of the voters when they approved the charter amendment providing for a financial plan for subways, and for the appointment of the commission, the City Council has rescinded the resolution adopted about two years ago which made possible the establishing of a rapid transit commission.

It is the opinion of Sidney D. Walden, chairman of the old commission since Dec. 5, 1922, that between now and next January the new commission, with the work already accomplished, should be able to complete its plan of routes for the initial system and be ready to submit such plan at the earliest spring election.

Special Rate for Advertising Purposes

Between 3,000 and 4,000 persons residing along the line of the Fort Wayne & Northwestern Traction Company, a subsidiary of the Indiana Service Corporation, took advantage on Sunday, Sept. 14, of a special advertising feature promoted by the local company, by which passengers along the line from Fort Wayne to Kendallville were hauled from any place to any other point for a flat fare of 25 cents.

The campaign was started to acquaint prospective car riders with the new equipment which has been placed in use since the line was taken over by the local corporation and several new interurban cars were used. Every car during the day was double headed, while two trailers were added to several of the cars to handle the crowds. The regular tariff for the Kendallville-Fort Wayne trip is 95 cents.

Temporary Ten-Cent Fare in Philadelphia Upheld

Through a decree handed down by the Superior Court on Sept. 19 the Public Service Commission's ruling granting the Philadelphia Rapid Transit Company, Philadelphia, Pa., a 10-cent cash fare, with two tokens for 15 cents, was upheld and went into effect on Sept. 25. Simultaneously the new schedule of free transfers also became effective in all but the central business district, where 3-cent exchanges are now required. The new zoning system, with its 8-cent fares in the city limits and 5-cent fares outside, was another change in operation made Sept. 25. The new rates are to continue in force until the fare question is settled finally by the commission.

City Solicitor Joseph P. Gaffney and his staff are preparing for two steps in the city's fight against the increase in fares. The Superior Court on the first Monday in October will take up the city's appeal against the recent order of the Public Service Commission temporarily increasing fares. Shortly thereafter the city will ask the Public Service Commission to proceed with the hearings on the company's petition for permanent increase of fares.

In its order of Sept. 19 the court held that the commission was legally justified in issuing the temporary increased fare order, that the company had fulfilled its obligations at the commission's hearings and had presented a case justifying the increase asked, and further, that the city of Philadelphia, protesting the increase, had not been ready to present its case, which was not the fault of the Philadelphia Rapid Transit Company. The court held that if the company was not permitted to begin collecting the higher fares pending completion of the hearing "irreparable injury" would be done to the company.

Opposes Bus Lines on Car Routes in Kansas City, Kan.

The City Commissioners of Kansas City, Kan., have taken a position definitely opposed to the operation of bus lines on street car routes. An ordinance giving a franchise to a bus company to operate between Kansas City, Kan., and Kansas City, Mo., has been held up for several weeks, and while it has not been finally denied, the bus operators have been instructed to designate some route other than that now used, which follows the street car lines on Minnesota Avenue, the main street and over the intercity viaduct, the route of the intercity street cars. This bus line plies on the main street of Kansas City, Kan., to the union station, of Kansas City, Mo., going through the main business district of the latter city also.

Fort Wayne Lines Rerouted

After several months of intensive investigation, the Indiana Service Corporation has rerouted its lines in Fort Wayne, Ind., in an effort to relieve congested traffic conditions in the center of the downtown district. The changes were put into effect on Sept. 15.

Under the new routing schedule several of the "double-end lines" have been so hooked up with other routes that a large amount of the traffic is diverted from Calhoun Street, the congested business thoroughfare. The number of transfers necessary to be issued has also been reduced by the change in routing.

Experiment with Pass Being Studied in Pittsburgh

Members of the Traction Conference Board at Pittsburgh and officials of the Pittsburgh Railways are watching with interest the result of the weekly pass experiment in the McKeesport district.

Lines on which the pass is in use are Route 56, Lincoln place to Sinclair Street, 3.97 miles; Wilmerding to State Road, 3.77 miles; Wilmerding to Market Street, 5.81 miles, and Glassport to Sinclair Street, 3.18 miles. The Wilmerding to Market Street pass costs $1.70 and the other passes cost $1.25. The experiment will continue until Jan. 1.

International Would Establish Buffalo-Tonawanda Bus Service

The International Railway, Buffalo, is attempting to induce its bondholders to consent to discontinue interurban service on the Buffalo-Tonawanda and Military road lines and to agree to permit the tracks to be taken up. It is the aim of the company to start bus service in Delaware Avenue between the Buffalo city line and Tonawanda in place of the Buffalo-Tonawanda interurban division and along the Military road from the Buffalo city line to Tonawanda. The village of Kenmore will agree to the abandonment provided the International Railway will establish a crosstown bus service between Kenmore and the River road industrial district, a distance of about 2 miles.

First Trackless Trolley Route for Albany

Following a conference in the Mayor's office it was decided that the United Traction Company, Albany, N. Y., will have its first trackless trolley line in operation as soon as possible. The plan is to operate over the Country Club route instead of the present trolley line as the opinion of those at the meeting was that the trackless trolleys would solve the transportation problem of that section.

The decision to operate trackless trolleys over the Country Club route, instead of the present trolley line, came after those at the meeting unanimously decided that the trackless vehicles would solve the transportation problem of that section. By extending the line to McKownsville, the line will give hundreds of persons trolley service to Albany's business section. Those living at McKownsville now are compelled to walk to the Country Club terminal station.

The transportation problem for the Country Club section has been under discussion for some time and several months ago delegations from the improvement associations of that section, representatives of the United Traction Company and Mayor Hackett inspected the Rochester trackless trolleys.

The United Traction Company will deed to the city of Albany the right of way in Western Avenue, 33 ft. of roadway, for which the city is to grant a franchise for the new line. It is expected that an ordinance will be introduced at the meeting of the Common Council giving the traction company the franchise. Unanimous consent of the Council will be asked, and if given, the ordinance will also be passed and will be signed immediately by Mayor Hackett. The company will then make application to the Public Service Commission for the certificate of convenience and necessity.

Buy Your Tokens in Advance.—The public relations department of the Pittsburgh Railways, Pittsburgh, Pa., has sent a communication to school principals asking their co-operation in placing before the students the matter of providing themselves with car tokens in advance of their intended use. The company promises to send to the school the required number of tokens for sale the day previous to any intended trip to any of the Pittsburgh institutions or manufacturing plants. The belief that car checks in advance will speed up traffic is the company's motive in making this suggestion.

It's a Courtesy Desk

THE "Complaint Desk" in the Surface Lines offices has been rechristened.

It's the "Courtesy Desk" now.

The change was suggested by the official who reads the letters received daily from passengers. He found a constantly increasing percentage of them begin "I wish to commend——"

So, he asked, why not give the desk a cheerful name significant of the pleasant tone of most of the correspondence?

There are complaints, too, of course. It could not be otherwise in an organization of 12,000 trainmen dealing with millions of riders daily.

But the point is that there are more bouquets and fewer brick bats.

Surface Lines trainmen are the best paid street car men in the United States. The great majority of them have been in the service many years. It is their life work. The occasional grouch among them is as unpopular with them as with the public, and he doesn't last long.

Reports from passengers relative to service are always thankfully received. They are a direct aid to efficiency.

Chicago Surface Lines

Henry A. Blair
President

More Bouquets than Brickbats in Chicago Suggests Department Change

Will Run as Belt Line.—The Tacoma Municipal Railway line beginning Oct. 1, will operate as a belt line, under a contract between the city of Tacoma and the Northern Pacific, Great Northern, Milwaukee and Union Pacific Railroads. The ordinance providing for the contract bore an emergency clause, permitting it to become effective immediately.

Five-Year Grant Accepted. — A. F. van Deinse, president of the Columbus, Delaware & Marion Electric Company, which operates the street railway at Delaware, Ohio, announces he will accept the new 5-year grant made by the Delaware Council. The new franchise reads that the company will not have to pave or repair streets in the city in the future.

Outing to Railway Officials in Rochester. — The annual party given by Edward H. Chapin, vice-president National Car Wheel Company, Rochester, to the railway officials of Rochester and vicinity took place this year on Sept. 17 at Mr. Chapin's summer home on Conesus Lake. A number of prominent traction executives and public officials from central New York were present and had the usual good time.

Fire Wreckage Purchased.—The Buffalo Sash Weight & Foundry Company, Inc., Buffalo, has purchased the wreckage involved in the $400,000 fire which recently destroyed the carhouse of the Grand Rapids Railway, Grand Rapids, Mich. The purchase involves the remains of about 60 street cars, a large quantity of miscellaneous car parts and all the rails and structural steel forming part of the damaged carhouse. The wreckage will be moved to Buffalo.

Extension of Time for Bus Service.—An extension of time until Nov. 30, 1924, has been granted the Key System Transit Company in which to install a satisfactory local bus service, supplementing its Alameda-Oakland service, as recently directed by the California Railroad Commission. Application had been made by the Peerless States, Inc., for permission to install such intercity service.

Authorizes Additional One-Man Cars.—Authority has been granted the Columbia Railway, Gas & Electric Company by the South Carolina Railroad Commission to put on one-man cars on additional lines in the city of Columbia where travel conditions warrant. R. L. Peterman, for the company, stated that the intention is to extend gradually the one-man car system as conditions warrant. One-man cars are already in use on a number of the lines of the railway.

Service-at-Cost Contract Ready.—The public utilities acquisition committee of Milwaukee, Wis., through its chairman, Fred S. Hunt, has announced that its reports and contract terms embodying a service-at-cost contract between the city and the Milwaukee Electric Railway & Light Company have been completed for submission to the Common Council on Sept. 29. If the proposed contract, which is the result of a four-year period of investigation, is approved by the Council it will go to the voters at a referendum election.

Financial and Corporate

Sale of United Railways, St. Louis, Discussed Again

Discussion of the terms for the reorganization of the United Railways, St. Louis, Mo., was expected to result in the adoption of a plan in final form at the meeting of the reorganization committee in New York on Sept. 26. In anticipation of that meeting it was stated that the holders of St. Louis Transit 5s had agreed to accept $300 cash and 5½ shares of new 7 per cent preferred stock for each $1,000 of bonds, with the right also accruing to them to purchase new common stock. In this way Transit bondholders would receive $2,937,000 cash and 53,845 shares preferred stock. Holders of the present $16,383,000 of preferred stock would also have the right to purchase new preferred stock. It was not stated in advance of the meeting just what the fate of the $24,913,000 of common stock would be. That issue is of nominal present value and is of future potential value only as its holders may be permitted to participate in the reorganization. It is expected, however, that the North American Company will furnish most of the capital for refinancing.

The Missouri Public Service Commission fixed the railways valuation at $53,000,000 as of January, 1919, and the reorganizers added $4,200,000 for betterments and extensions since that date. They anticipate no difficulty in having this valuation accepted by the state and city of St. Louis. A return of 7 per cent on the $57,200,000 valuation would mean an income of $4,004,000.

The reorganization committee plans to pay off in cash $4,100,000 of underlying bonds, $4,200,000 in receiver's certificates and $2,000,000 of the $6,500,000 suburban bonds. This would of course reduce the fixed charges materially.

About $12.000,000 is required to pay off these obligations and provide working capital. The committee also entertains the view that co-ordination of the street cars and buses is inevitable.

The St. Louis Transit Company 5 per cent bonds mature on Oct. 1. It is probable that friendly foreclosure proceedings will be instituted in the federal court under this issue of bonds to work out the reorganization plan.

Detroit Street Railway Profits Decline

Increased costs of operation account for the decline in the profits of the Detroit Department of Street Railways during the fiscal year ended June 30, 1924. Ross Schram, general manager of the lines, so explained on Sept. 23. During 1923-24, the lines earned $834,-713, a decrease of $103,752 from the figure for 1922-23, the first year of operation.

The revenue for transportation for 1923-24 was $21,838,003, all but about $7,000 of which was from passengers. Revenue from other sources totaled $758,083. The toal operating revenue of $22,596,087, exceeds that of the preceding year, which was $20,-196,163.

Total operating expenses for 1923-24 were $16,374,841, as compared with $14,450,612 for the year before. Included in this item is a $1,100,000 increase in wages, following a concession to the platform men.

One year ago this month the fare was increased from 5 cents to 6 cents, nine rides for 50 cents.

Last Louisville Deferred Dividend Paid

The Louisville Railway, Louisville, Ky., has declared a 5 per cent dividend on its preferred stock, payable on Oct. 2, to stockholders of record as of Sept. 17. This cleans up the last of the deferred dividends on the preferred stock. At one time the accumulation on this issue reached 22½ per cent. The payment represents $175,000 on the preferred of $3,500,000 and brings dividends on preferred up to Jan. 1, 1924.

Revenue in Toledo Improves

The first half of September showed an improvement in revenue for the Community Traction Company, Toledo, Ohio, as compared with a similar period last year. Under a 9-cent cash fare revenue for the first 17 days of the month increased about $7,000, or showed 4.1 per cent improvement as compared with the same number of days in August. Indications are that the present 10-cent cash fare with three-for-quarter token rate will be given a thorough trial, according to President Adams. The company expects to save about $200,000 a year if it can eliminate the Indiana Avenue line and direct bus competition.

Gross revenue in August was $273,-922, as compared with $313,958 for the corresponding month a year ago. Operations for the month resulted in a deficit of $47,426, which brings the deficit to the stabilizing fund to a total of $77,846.

In his report to the board Commissioner Graumlich said that there was carried a total of 3,710,460 revenue passengers during the month; that this continued decline in car riding more than offset the changes in the rate of fare so that the passenger revenue dropped to $246,251 for the month. Operating expenses were reduced as compared with last year from $253,838 to $229,156. Car mileage operated was also cut from 666,761 to 562,874. Operation of two bus feeder lines produced a revenue of $1,080 at a cost of $2,176.

Release of Montreal Tramways Voting Control Demanded

The majority shareholders of the Montreal Tramways & Power Company, Montreal, Que., headed by United Securities, Limited, during the week ended Sept. 6 requisitioned a special general meeting of shareholders under the provisions of the English companies (consolidations) act and the articles of association of the company. The Tram Power directorate had until Sept. 10 to comply with the requisition, but failed to do so. Therefore, as provided under the act referred to, and the articles of association of the company, these shareholders withdrew their requisition

Conspectus of Indexes for September, 1924

Compiled for Publication in this Paper by

Albert S. Richey
Electric Railway Engineer
Worcester, Mass.

	Latest	Month Ago	Year Ago	Since War High	Since War Low
Street Railway Fares* 1913 = 4.84	Sept. 1924 **7.08**	Aug. 1924 **6.99**	Sept. 1923 **6.95**	May 1921 **7.24**	May 1923 **6.88**
Street Railway Materials* 1913 = 100	Aug. 1924 **153**	July 1924 **155**	Aug. 1923 **166**	Sept. 1920 **247**	Aug. 1924 **153**
Street Railway Wages* 1913 = 100	Sept. 1924 **221**	Aug. 1924 **221**	Sept. 1923 **215**	Sept. 1920 **232**	Apr. 1923 **207**
Steel—Unfilled Orders (Million Tons) 1913 = 5.91	Aug. 31 1924 **3.29**	July 31 1924 **3.19**	Aug. 31 1923 **5.41**	July 31 1920 **11.12**	July 31 1924 **3.19**
U. S. Bank Clearings Outside N. Y. City (Billions)	Aug. 1924 **15.25**	July 1924 **16.24**	Aug. 1923 **14.60**	Mar. 1920 **18.54**	Feb. 1922 **10 65**
Business Failures Number	Aug. 1924 **1 533**	July 1924 **1.533**	Aug. 1923 **1.440**	Jan. 1924 **2 258**	Sept. 1923 **1.279**
Liabilities (millions)	**40.85**	**49.18**	**48.75**	**109 1**	**30 83**

	Latest	Month Ago	Year Ago	Since War High	Since War Low
Eng. News-Record Construction costs 1913 = 100	Sept. 1924 **211.2**	Aug. 1924 **213.2**	Sept. 1923 **221.5**	June 1920 **273.8**	Mar. 1922 **162.0**
U.S. Bur. Lab. Stat. Wholesale Commodities 1913 = 100	Aug. 1924 **149.7**	July 1924 **147.0**	Aug. 1923 **150.1**	May 1920 **247**	Jan. 1922 **138**
Bradstreet's Wholesale Commodities 1913=9.21	Sept. 1 1924 **12.81**	Aug. 1 1924 **12.62**	Sept. 1 1923 **12.91**	Feb. 1 1920 **20.87**	June 1 1921 **10.62**
Dun's Wholesale Commodities 1913 = 120.9	Sept. 1 1924 **188.7**	Aug. 1 1924 **188.0**	Sept. 1 1923 **188.0**	May 1 1920 **263.3**	July 1 1921 **159.8**
U.S. Bur. Lab. Stat. Retail food 1913 = 100	Aug. 1924 **144**	July 1924 **143**	Aug. 1923 **146**	June 1920 **219**	Mar. 1922 **139**
Nat. Ind. Conf. Bd. Cost of living 1914 = 100	Aug. 1924 **162.8**	July 1924 **161.7**	Aug. 1923 **161.6**	July 1920 **204.5**	Aug. 1922 **154.5**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population.

Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen and conductors on 105 street and interurban railways in the United States, operating more than 100 passenger cars each, and weighted according to number of cars.

for a meeting, and require the president and directors of the company to call a meeting. The objects outlined in the document served upon the board on Sept. 10 call for certain changes in the articles of association, and also for the issuing of notices for a further extraordinary general meeting, at which the resignations of the present board are demanded, and a new board substituted, and also that further specified changes be made in the articles of association, and that a proxy representing the controlling votes of the Montreal Tramways Company be turned over to the new interests by the trust company.

When Bankers Are Philanthropists.—The Community Traction Company, Toledo, is not now paying dividends on its 8 per cent preferred stock, due to operating deficits. However, holders of the stock are being paid the regular distribution by Henry L. Doherty & Company, who is taking an assignment of the dividends when and if they shall be paid in the future.

Fate of Niagara Line Uncertain.—Partial confirmation of the report that the Niagara Falls Power Company, Inc., will take over the Niagara Gorge Railway, Inc., Niagara Falls, N. Y., has been obtained, but it is stated no early abandonment of the scenic line in the lower Niagara gorge is contemplated until after approval has been obtained for the super-power project proposed by the power company in the lower gorge at Niagara Falls. The Niagara Gorge Railway is one of the most famous scenic electric lines in the world. The road extends from Lewiston to Niagara Falls.

Interborough Elects Two Directors.—H. M. Fisher and Robert C. Rathbone have been elected directors of the Interborough Rapid Transit Company, New York, to fill vacancies. Mr. Fisher is secretary of the company and Mr. Rathbone is president of Robert C. Rathbone & Company, Inc., New York.

Duluth Dividend Deferred.—A. M. Robertson, president of the Duluth-Superior Traction Company, Duluth, Minn., has sent a letter to preferred stockholders explaining that earnings during recent months have not been sufficient to cover dividend requirements for the three months ended Sept. 30, 1924, and that in view of this the directors deemed it advisable to defer the dividend due on the preferred stock at this time.

Capital Decreased.—The Lafayette Street Railway, Inc., Lafayette, Ind., has decreased its capital from $200,000 to $100,000.

York Dividend Increased.—The York Railways, York, Pa., has declared a quarterly dividend of 75 cents a share on the common stock payable on Oct. 15, thus placing the stock on a $3 annual dividend basis. Heretofore the company had been paying dividends at the rate of 50 cents a share quarterly. The regular quarterly dividend of 62½ cents a share also was declared on the preferred stock.

Seeks Partial Abandonment in Yonkers.—Application was made to the Public Service Commission by the Yonkers Railroad, Yonkers, N. Y., on Sept. 22 for an order permitting it to abandon a portion of its route and franchises in the city of Yonkers. The company claims that in some cases the lines are single track and that it is difficult to operate them because of heavy grades. Other lines are on outlying streets and it is claimed that there are not enough passengers using the cars. Other factors are the long average length of ride and the inability of the petitioner to increase the fare sufficiently to meet the continued high cost. The petition further alleges that many of the outlying lines are in such condition that a considerable amount of money must soon be expended by the company for renewal and that there is no prospect of paying for such renewal by continued operation.

Personal Items

Specialist in Public Relations in Bus Organization

William Welton Harris was elected vice-president of the Fifth Avenue Coach Company, New York, on Sept. 17. Mr. Harris will work directly under John A. Ritchie, now chairman of the board of directors of the company. Mr. Harris is well known in newspaper and publicity circles. In 1895 he went with the Chicago *Tribune* as a reporter. Subsequent to that he was for fourteen years with various publications controlled by the late James Gordon Bennett. From 1914 to 1916 he was managing editor of the New York *Sun*.

In 1916 Mr. Harris joined the staff of Ivy L. Lee, for which organization he specialized in finance, steam railroads and public utilities. He handled the publicity work in connection with the reorganization of the utilities at New Orleans as the New Orleans Public Service, Inc. Other activities by him while with Mr. Lee included publicity work for the Southwestern Gas & Electric Company, Electric Bond & Share Company and the Interborough Rapid Transit. In this work he specialized in street railroads and public utility cases as author, lecturer and consultant.

W. J. Jones, superintendent of the Winnipeg, Selkirk & Lake Winnipeg Railway, Winnipeg, Man., has been appointed superintendent of transportation, succeeding Mr. Beckwith. Mr. Jones is well known in Winnipeg, having been connected with the railway service there for more than 10 years. After serving for several years both as motorman and conductor, he was made traffic supervisor in 1918. Two years later he was appointed divisional superintendent of the central division, and in 1921 he was appointed superintendent with offices at Selkirk.

J. C. Hawes has been appointed superintendent of the Winnipeg, Selkirk & Lake Winnipeg Railway, Winnipeg, Man., to succeed W. J. Jones, recently made superintendent of transportation. Mr. Hawes has been a resident of Selkirk for a number of years.

Obituary

Arthur S. Huey, chairman of the board of directors of H. M. Byllesby & Company, died at the South Shore Country Club, Chicago, on Sept. 16. Mr. Huey had been connected with the electrical industry since 1885 and had been a prominent figure in the operation and management of the Byllesby properties since 1902. When the firm of H. M. Byllesby & Company was organized in 1902 he became one of the partners and was made vice-president in charge of operation. In this capacity he supervised the operation of about twenty groups of utility properties. In the spring of the present year he was elected chairman of the board to succeed the late Henry M. Byllesby.

Frank P. Redmond, 47 years old, assistant secretary to the Public Service Commission in New York City, died recently at a hospital in Watertown, N. Y., from heart disease. He was formerly chief of the automobile bureau in New York City.

M. M. Shipe, 78 years old, builder of the first electric railway in Austin, Tex., died at his home there recently. Mr. Shipe long had taken an active part in the up-building of Austin and for many years was interested in local street railway operation. As a contractor he laid the tracks of the Austin property.

Matthew James Kennedy, prominent in transportation circles, died on Sept. 1 at the Royal Victoria Hospital in Montreal, at the age of sixty-one years. Mr. Kennedy was a striking example of the young man who begins at the bottom of the ladder and mounts to the top. He served as a driver with the Montreal Tramways when the vehicles used by the company were horse-drawn. Ultimately he became superintendent of the company. Later he joined the staff of the Brooklyn Rapid Transit Company. He returned to Montreal in 1905 and rejoined the forces of the Montreal Street Railway as superintendent of the freight department. He remained with the company in that capacity until 1910, when he resigned to organize the Kennedy Taxi Company, of which he became general manager.

W. B. Rees, pioneer in Los Angeles local and interurban electric railway business, died recently in San Marino. He had been librarian of the Los Angeles Railway since 1918. Mr. Rees entered the railway organization in 1901 on survey work for local and interurban lines. He helped to plan the lines to Whittier, Long Beach and Santa Ana.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Official View of Foreign Business Hopeful

Information from Official Washington Source Indicates that Foreign Competition Will Be Keen in Steel Market—Comments on Other Domestic and Foreign Affairs Significant

FROM an authoritative Washington source, the JOURNAL is able to reflect certain expressions of opinion with regard to domestic and foreign business of particular interest to manufacturers and railway men. As official circles in Washington see it, anything that tends to increase employment anywhere in the world has its direct beneficial result on the business of the world. This the Dawes plan is expected to do. It is considered, at its lowest value, to be an economic truce that will last at least three years. The hope is that at the end of that time the European nations will be so impressed with the virtues of the plan that they will be prepared to carry on indefinitely under its terms.

The prospects are that the American manufacturers will experience keener competition from Europe from now on. This is believed to be particularly true of steel. The whole Ruhr district of Germany has been thoroughly re-equipped with modern machinery. This should greatly reduce production costs and probably make the Ruhr district one of the cheapest centers of steel production in the world, especially for the next year or two, while the scale of wages is at its present level.

However, American steel manufacturers are confident that this competition can be met. To that end a very definite movement is on foot to extend the use of labor saving machines and to re-equip with the most modern methods. This undoubtedly forecasts lower prices. The opinion at Washington is that American manufacturers will hold their own against the Ruhr competition.

Not so much that was favorable was said for British steel production. Opinion on the situation in England was that it is very doubtful whether the competition of the Ruhr can be withstood, in view of the generally bad labor situation and the unsound economic policies being pursued. There is a note of discouragement among British business men. This was not only expressed in official Washington, but both E. J. Mehren, vice-president McGraw-Hill Company, and H. L. Brown, editor ELECTRIC RAILWAY JOURNAL, gathered the same impression from their discussions with business men abroad this summer.

Evidence of the very unsatisfactory labor situation and poor production efficiency in Great Britain is afforded by the negotiations now under way for the sale of 2,000,000 tons of coal for delivery in Italy. An American concern is competing for this business against British coal. With a $40 a week minimum for labor in the coal fields here as against an $8.50 minimum in British coal mines, the American concern is able to quote a better price delivered in Italy than can the British concern.

Russia is still not considered a satisfactory or permanent market for American products. Purchases are all made by the Russian government. The plan of purchasing is to establish a corporation in each country, under the flag of that country, which then buys for the Russian government. The American seller must satisfy himself as to the credit of this corporation and not proceed under any illusion that he can collect his bill in Russia. The only credit behind the corporation to be counted on is that which it can show in American banks. In Italy, Switzerland and Germany, these corporations have been dissolved and the business of the Russian government taken away from those countries because some incident which occurred displeased the Moscow officials.

It was stated that the only reason Russians are buying materials and products here is that they can either get them cheaper or cannot get them anywhere else. The buying has been heavy here recently, apparently a reflection of the Russian desire to influence recognition by the United States through the indirect pressure brought by manufacturers. In fact, certain groups of manufacturers have lent themselves to pressure of this kind on promise of large orders.

The word with respect to Latin America is that selling efforts there should be kept up despite the recent revolutions, labor troubles, currency depreciation, unseating of a president, etc. As long as the goods can be sold and the money collected, there is no reason to cease activities because of local political disturbances.

According to the Washington view, the coal industry is now undergoing a general and fundamental improvement. The things needed for its continued betterment are peace and transportation. It never was possible to bring about any substantial improvement under periodic suspension of production or strangulation of the mines due to lack of transportation. The natural economic laws never had a chance to work in this field. Now that there has been peace for 2 years, with the probability of 2½ years more of it, and a generous supply of transportation, the difficulties of the coal fields are being worked out under the free play of economic laws. In this way both the high cost producer and the surplus of labor are being eliminated. As it was expressed, the industry is now undergoing a surgical operation, a painful procedure, but one that cannot be other than helpful.

Metal, Coal and Material Prices

Metals—New York	Sept. 23, 1924
Copper, electrolytic, cents per lb.	12.975
Copper wire base, cents per lb.	15.375
Lead, cents per lb.	8.00
Zinc, cents per lb.	6.45
Tin, Straits, cents per lb.	47.125
Bituminous Coal f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.15
Somerset mine run, Boston, net tons	2.125
Pittsburgh mine run, Pittsburgh, net tons.	1.875
Franklin, Ill., screenings, Chicago, net tons	1.875
Central, Ill., screenings, Chicago, net tons	1.55
Kansas screenings, Kansas City, net tons.	2.50
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	$5.55
Weatherproof wire base, N. Y., cents per lb.	18.25
Cement, Chicago net prices, without bags.	2.20
Linseed oil (5-lb. lots), N. Y., per gal.	$1.03
White lead, in oil (100-lb. keg), N. Y., cents per lb., carload lots	0 12
Turpentine (bbl. lots), N. Y., per gal.	0 87

Side Shows Are Outlawed

Fred C. J. Dell, director of exhibits of the American Electric Railway Association, has written to all exhibitors of buses at the coming convention of the association at Atlantic City asking for their kindly and whole-hearted co-operation in carrying out the spirit of the executive committee's resolution in which it cites the reasons for its opposition to demonstration of buses on the streets during the convention.

Rolling Stock

Detroit, Mich.—All four bids received by the Detroit Street Railway Commission for furnishing municipal buses have been rejected by the commission and new bids are being asked on new specifications. The new specifications provide for inclosed upper deck. According to a statement from the office of the general manager of the Detroit Street Railway, a sleeve-valve six-cylinder motor is permissible in the design. Bids based on lots of 50, 75 and 100 buses will be called for, to be opened on Sept. 26. Lower bids are expected than were received recently when two local and two outside firms submitted bids. Engineers of the D. S. R. have been working with engineers of interested bus companies, and the revised specifications are the result.

Brooklyn, N. Y.—The JOURNAL was misinformed on certain details of the order for four three-section articulated units for use on the B.-M. T. mentioned in last week's issue. This order was awarded by the New York Rapid Transit Corporation to the Pressed Steel Car Company. Each unit will accommodate 550 passengers. The end cars will seat 56 and the center car 48. The motor and control equipment and the trucks will be the same as mentioned in the item last week.